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THE UNIVERSITY OF ALBERTA

AN ANALYSIS OF OVERMARKING IN HIGH SCHOOL MATHEMATICS
ENGLISH AND SOCIAL STUDIES

by

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A Thesis

Submitted to the Faculty of Graduate Studies
In Partial Fulfillment of the Requirements for the
Degree of Master of Education

Department of Secondary Education

Edmonton, Alberta

May 1967

UNIVERSITY OF ALBERTA
FACULTY OF GRADUATE STUDIES

The undersigned certify that they have read, and recommend to the Faculty of Graduate Studies for acceptance, a thesis entitled "An Analysis of Overmarking in High School Mathematics, English, and Social Studies," submitted by Joseph A. Stevenson in partial fulfillment of the requirements for the degree of Master of Education.

ABSTRACT

This study investigates students' marks in Mathematics 20 and 30, Language 20 and English 30, and Social Studies 20 and 30 for the 1963-64 and 1964-65 school years, and four factors which may be related to these marks. The four factors are (1) student attendance at school, (2) class size, (3) the number of years of university training of the teacher, and (4) the number of years of teaching experience of the teacher. The main problem investigated is overmarking.

Five questions were formulated to give direction to the study. The high schools of Alberta were classified into three school categories -- small, medium, and large -- according to the number of teachers in the school. The large high schools were subdivided into three groups -- large rural high schools, large Calgary high schools, and large Edmonton high schools -- and this resulted in five school categories for the study.

A sample of students from each of the medium and large high school categories was used, but the total enrollment of students in the small high schools was used because of the relatively small number of students involved.

The data were analyzed by computer at the University of Alberta to provide the basis for answering the five questions.

The study reveals that overmarking did occur in all school categories, but it occurred to the greatest extent in the small high schools. The amount by which overmarking occurred ranged from about five to ten percentage points. Student attendance at class and the amount of university training of the teacher did not affect the overmarking that occurred. Class size and the amount of teaching experience of the teacher did have some effect on the overmarking that occurred.

This study also reveals that teachers throughout all sizes of high schools in Alberta were consistent in their view of the achievement of their students, as indicated by the marks which the students received.

ACKNOWLEDGEMENTS

The author gratefully acknowledges the assistance of Mrs. V. A. Scharfenberg and Mrs. M. Dymond in gathering the data for this study from the records of the Department of Education, Province of Alberta. Appreciation to Mr. Walter Muir for his work in organizing and arranging the computer analyses at the University of Alberta is also gratefully expressed. In addition, appreciation for their assistance and suggestions is expressed to those who have worked as my thesis committee.

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CHAPTER I

THE PROBLEM

I. BACKGROUND OF THE STUDY

The population density of Alberta varied greatly in 1965. Most of the people resided in large urban centers, fewer resided in towns or close to towns where there was sufficient population to provide some of the urban characteristics, and a few resided in sparsely populated areas. The students who attended high school in each of these areas did so under somewhat different circumstances. The urban high school student commonly attended a large composite high school which had a large staff. These composite high schools offered a wide variety of subjects. The town student commonly attended a consolidated high school with a staff of from five or six to fifteen or more, and the subject offerings were varied, although not to the same extent as in the composite high schools. The student in the sparsely populated areas commonly attended a small high school. The staff usually numbered not more than five or six, and the subject offerings consisted mainly of the academic matriculation subjects, with very few other subjects being offered. Because of these differences, the physical and intellectual environment of the high school population of the province varied greatly, yet these students all had to compete on the same Departmental Examinations for a high

school diploma and for university matriculation.

Educators, as well as the general public in Alberta, have been interested in improving the educational opportunity of all the students of the province. With this in mind the Government of the Province of Alberta set up a Royal Commission on Education in 1958 to study education in Alberta. Dr. D. B. Black conducted a study of high school students' marks for this Commission. His work provided part of the motivation for this study.

Black studied the marks of the high school students who attended Alberta high schools from September 1955 to June 1958. In a report of the study Black states:

Theoretically, a common curriculum should mean common evaluation but such is rarely the case except in Grades 9 and 12 where Departmental Examinations are administered in selected subject areas. Different schools do, in fact, rate students differently. In such matters, discrepancies relating to the size of high schools have been found which are of too great a magnitude to be reconciled. (3:137)

Black further states:

Marks determined by the teacher as distinct from the single Departmental Examination system used in specific subjects in Grade 12, reveal an almost uniform higher rating of students in smaller schools. In subject areas tested in Grade 12 by Departmental Examinations, there is an appreciable downward drop in marks. It is noted that this downward trend is not confined exclusively to the smaller high schools, but appears uniformly throughout all schools. (3:150)

There were many facts which Black apparently did not take into account. Black used the average mark made by a student who took more than one course in a subject in any

grade as the subject mark for that grade. This would apply essentially to the students in the larger high schools where courses other than those numbered 10, 20, and 30 were commonly offered. If only courses numbered 10, 20, and 30 had been used for comparison, instead of all courses, then subjects common to all sizes of schools would have been used. It seems that this would be necessary before a valid comparison could be made.

Black grouped all of the marks in a subject area solely on the basis of the grade of the student taking them. For example, a student may have taken Mathematics 20, which is commonly a Grade XI subject, while he was in Grade XII. Thus, in Black's study Mathematics 20 was counted as both a Grade XI subject and as a Grade XII subject. Therefore, when Black compared Grade XI and Grade XII marks, he included some subjects common to both grades. To report Grade XI subject marks as Grade XII marks is misleading, and the figures reported by Black in his study are therefore somewhat invalid.

One purpose of this study was to compare the schools of various sizes in Alberta on the same bases, that is, to use only marks which were common to students in all sizes of high schools. This comparison should show more clearly where overmarking, if any, took place. A further purpose of this study was to investigate some of the possible causes for any differences in marks assigned by the teachers in the

various sizes of high schools.

II. THE PROBLEMS INVESTIGATED IN THE STUDY

This study investigated the marks assigned to students by their teachers and by the Departmental Examinations in Mathematics 20 and 30, Language 20 and English 30, and Social Studies 20 and 30 in 1964 and 1965. Answers to the following questions were sought:

1. Did any overmarking occur in these subjects in the small, medium, and large high schools of Alberta, and if so, to what extent?
2. Was attendance at school a factor which may have contributed to overmarking in the marks which were assigned to the students by their teachers?
3. Was class size a factor which may have contributed to overmarking in the marks which were assigned to the students by their teachers?
4. Was the number of years of university training of the teacher a factor which may have contributed to overmarking in the marks which were assigned to the students by their teachers?
5. Was the number of years of teaching experience of the teacher a factor which may have contributed to overmarking in the marks which were assigned to the students by their teachers?

III. SIGNIFICANCE OF THE STUDY

The educational organization of schools in Alberta has been changing rapidly during the last twenty years. Evenson and Smith reported that in the early 1950's ". . . only about 55 per cent of our high school population is taught in high schools which have three or more teachers from Grades X, XI, and XII." (9:64) The report of the Alberta Royal Commission on Education gives, for 1957-58, that ". . . 13 per cent of the Grade X, XI, and XII pupils were enrolled in schools having less than one teacher per high school grade taught." (22:347) This indicates a rapid decrease in the number enrolled in small high schools from 45 per cent in the early 1950's to only 13 per cent by 1957-58. In 1957-58 another 23 per cent of the students were enrolled in standard time high schools of enrollment under 100. (22:347)

In September, 1965, Downey reported that high schools of 1-39 students enrolled only 3.3 per cent of the high school students of Alberta, and 13.9 per cent were enrolled in schools of 40-99 students. Fifty per cent of the high school students were enrolled in schools of 400 or more students. (8:19)

The report by Downey on the small high schools of Alberta recommended that further changes in the structure of the educational organization take place. For example, he suggested the formation of multi-campus high schools to help

overcome some of the problems of smallness present in many rural high schools. (8:55-57) The present study will add to the fund of knowledge already collected about the smaller high schools, and therefore may help in directing the changes that are and will be taking place in Alberta.

The Grade XII Departmental Examination marks have been very significant to the students and to society. To the students they have been the key to the high school diploma, to university entrance, and to many job opportunities. To society they have indicated the ability of the student and thus have affected many decisions by management about employment or training that the student may have desired. This study will shed more light on the relationship of some other high school subjects to the Grade XII Departmental Examination subjects. It is hoped that this will help to give educators, and through them give the students and society, better insight into the real significance of the Grade XII Departmental Examination marks.

IV. DELIMITATIONS

This study was confined to the students in Alberta who received a mark of fifty per cent or higher in one or more of the subjects, Mathematics 20, Language 20, or Social Studies 20 in 1964, and then wrote the Departmental Examination in the corresponding subject numbered "30" in 1965, and the teachers who taught these students (fifty per cent was

the minimum mark required for advancement to the subjects numbered "30"). Students from the public and separate schools were included in this study, except for those from schools which were on the semester system. Students from the private high schools of Alberta were not included in this study.

The writer was mainly interested in a study of mathematics marks. However, to broaden the scope of this study, and to give a basis for comparison of the mathematics marks with marks in other subjects, it was decided to include English and Social Studies marks along with the mathematics marks.

A sample of about 900 students which was drawn by the Department of Education, Province of Alberta, in September 1965, was used for the medium and large high schools, but because of the small number, all students who took the above named courses in the small high schools were included in the study. This procedure resulted in the inclusion of the total population of the small high schools, but of only a sample of the populations of the medium and large high schools, for the school years under study. In order that sampling statistical techniques might be applied to the data, the group of students from the small high schools was regarded as a sample of students from small high schools over a period of several years.

The method of drawing the samples of students, and

the methods of eliminating certain students from them, are discussed in Chapter III. These procedures, and the inclusion of all the students from the small high schools, resulted in giving some groups of students which did not constitute random samples of the school populations. However, since no other procedure for obtaining the samples of students for use in this study seemed feasible, the groups of students used in this study were assumed to be random samples. Without this assumption, the application of the statistical techniques used in the analysis would have been inappropriate.

This study did not investigate teachers' methods of determining their students' marks. The psychological and sociological factors which may also be related to the assigning of marks to students were also not investigated in this study.

V. DEFINITIONS

The following terms are defined as they are to be interpreted in this study.

1. Teacher-given subject mark: the individual student's final mark in each subject which was sent to the Department of Education, Province of Alberta, by the principal of each high school.

2. Subject 30 final examination: the official Departmental Examination given in each subject in June 1965, which

was prepared and administered by the High School and University Matriculation and Examinations Board of the Department of Education, Province of Alberta.

3. Departmental Subject 30 mark: the student's mark on a Subject 30 final examination as reported to the student by the Department of Education, Province of Alberta.

4. Overmarking: assigning to a student teacher-given marks which were significantly higher than the corresponding Departmental Subject 30 marks.

5. Small high school: a public or separate high school in Alberta which had three or fewer teachers as listed in the list of Approved Secondary Schools in Alberta, 1964-65.

6. Medium high school: a public or separate high school in Alberta which had four to eight teachers as listed in the list of Approved Secondary Schools in Alberta, 1964-65.

7. Large high school: a public or separate high school in Alberta which had nine or more teachers as listed in the list of Approved Secondary Schools in Alberta, 1964-65.

8. Large rural high school: a large high school in Alberta, other than those in Calgary and Edmonton.

9. Large Calgary, high school: a large high school in the City of Calgary.

10. Large Edmonton high school: a large high school in the City of Edmonton.

VI. PROCEDURE

The high schools of Alberta were divided into three groups called small high school, medium high schools and large high schools. Each student included in the study was classified according to the size of high school he attended. Only those students who completed both of their Subject 20 and 30 courses in the same school were included. Each student was matched with the teachers who taught him his subjects. In schools where, according to the Form A Cards of the Department of Education, there was only one teacher teaching a subject, the students enrolled in that school were matched with that teacher. Where more than one teacher taught a subject in a school, a letter was sent to the principal asking him to list the teachers who taught the students included in this study each of the subjects under investigation. In some cases this information was not available from the principal, so the students were therefore written to and asked to supply the names of their teachers. When all of these sources failed to provide the required information, the student was dropped from the study, except for those from the City of Edmonton. It was not possible to match the names of the students from the City of Edmonton with their teachers' names; therefore, the analysis which related to teachers had to be omitted from this study for those students from the City of Edmonton, but they were included in the rest of the analysis.

Because of this problem with the Edmonton students and their teachers, and because of the number involved, the large high schools were subdivided into three groups, which were treated separately in the analysis. These groups were large rural high schools, large Calgary high schools, and large Edmonton high schools.

To determine the degree of overmarking in the Subject 20 and teacher-given Subject 30 marks, these marks were compared with the corresponding Departmental Subject 30 marks. The Departmental Subject 30 marks were selected as the criteria for the following reasons:

1. They were the most significant of the three sets of marks in each subject area.
2. The same Departmental Examination papers were written by all of the students included in this study.
3. The Departmental Examination papers were marked anonymously.

To determine whether or not attendance, class size, teacher training, and teaching experience were related to overmarking, each of these four factors was compared for the two school years under investigation, and also correlated with the appropriate marks. It was assumed that a significant positive correlation coefficient indicated a positive effect on the marks, and a significant negative correlation coefficient indicated a negative effect on the marks. It was also assumed that attendance in each subject

was equal to attendance at school for the school year.

VII. SOURCES OF THE DATA

The Department of Education, Province of Alberta, and the Alberta Teachers Association gave the writer the use of their records to obtain the information needed for this study. The clerical staffs of these organizations were employed in the collection of the data. In addition, many of the principals of the high schools of Alberta, and a few of the students, have also supplied information. In a few cases where the Department of Education records were incomplete for some students, school boards supplied attendance figures.

VIII. ORGANIZATION OF THE THESIS

The rest of this thesis is organized as follows: Chapter II presents a review of the research related to assigning marks or grades to students. Chapter III includes a report of the data and the statistical analysis of the data made by computer at the University of Alberta. Chapter IV presents the findings, the conclusions drawn, and the inferences made on the basis of the analysis.

CHAPTER II

REVIEW OF RELATED RESEARCH

I. SCOPE OF THE REVIEW

Research in the field of student achievement as indicated by the marks they receive in their subjects has been very extensive. Wrinkle (37) listed a selected bibliography of over 100 books and articles on the topic. The literature seems to cover four general areas associated with students' marks. These are: (1) evidences of their unreliability, (2) factors related to marks assigned to students, (3) the effects of the unreliability of marks, and (4) ways to increase their reliability. Because of the limitations of the present study, only the literature related to the first two are covered in this review.

II. EVIDENCE OF THE UNRELIABILITY OF MARKS

Perhaps the work of Starch and Elliott (29) in 1912 and 1913 can be credited with really getting the study of the reliability of marks started. Nearly every article on the topic mentions their work. They prepared copies of a student's answer papers in English, Geometry, and History and had each one marked by more than 100 teachers. The range of marks that resulted was startling, the degree of spread being from about 30 per cent to 90 per cent in each case. They found that the Geometry marks had the greatest

variability. Since mathematics was supposed to be a more exact subject than either History or English, the opposite case had seemed more probable.

In 1915, Rugg (25:137) investigated the degree of consistency when a teacher marked the same examination twice with an interval of time between the markings. He found that the mean variation was almost never less than five per cent.

Hulten (14) reported on twenty-eight teachers who, in 1925, marked the same English papers with a time interval between markings. He concluded that teachers were not consistent in giving either high or low grades and that their marks varied greatly on the two markings. He also showed that a teacher with a university degree and several years of experience was just as variable in assigning marks as were teachers with less training and experience.

Douglass (7:489-504) investigated, in 1935, the relationship between a previous year's mark in mathematics and a current year's mark and found a low relationship. He found five other factors which had a more positive relationship than did the previous year's mark in mathematics.

Douglass also listed (7:495-504) about 225 studies in which correlation coefficients were calculated between mathematics marks and various other factors, such as intelligence quotients, ability test results, and achievement test results. The highest correlation coefficient reported was

.88, which occurred between marks in grade nine mathematics and Roger's Mathematics Ability Test. The lowest correlation coefficient reported was .01. The mean of all these correlation coefficients was .47 and their standard deviation was .16. Since many of these correlation coefficients were calculated between sets of mathematics marks, they have indicated to some degree the relationship between various mathematics marks assigned to students.

In 1960, Black (3:137) reported a study in which the final marks assigned to Alberta students in grades ten and eleven were compared to their final marks in grade twelve, many of which were determined by a final Departmental Examination. He found evidence that there was a general tendency for teachers in small high schools to assign final marks which were too high when these marks were compared with the results of the Departmental Examinations and other final marks assigned at the end of grade twelve.

Perhaps this evidence on the unreliability of marks can best be summarized by relating a situation reported by Burton (4:666). He told of a case where a teacher constructed a model answer paper to assist him in marking a series of papers which were being evaluated by a number of teachers. The model answer paper was accidentally mixed with the other papers and as a result was marked by the other teachers. The marks assigned to it ranged from 40 to 90 per cent.

III. FACTORS RELATED TO STUDENT'S MARKS

In his review of the literature the writer was unable to discover any studies of either attendance at school or of class size as factors related to the marks which students receive in their subjects.

Investigations reported in the literature on causes of the unreliability of marks can be divided into two groups: 1. general causal factors, and 2. specific causal factors. Other factors which have been investigated relate to the professional training and the professional teaching experience of the teacher.

Studies on the General Causal Factors of Unreliability

Wrinkle (37:44) in 1944 suggested that the unreliability of marks came from two main factors: (1) a mark may represent an almost unlimited number of variable factors, and (2) a mark is often based on class achievement, and therefore the basis of the mark changes as the composition of the class changes. Starch (28:630-636) agreed with these and also added that when a teacher was marking some papers, differences resulted due to the pure inability of the teacher to distinguish between closely related degrees of merit. He suggested that this reason was probably the most significant one in accounting for differences in marks.

Rugg in 1915 (25:137), Wrightstone in 1946 (36:27), and Vredevoe in 1953 (32:170-182) all suggested that marks

varied because of differences among teachers in terms of: (1) the specific objective or characteristic that was being rated, (2) the lack of a common standard of value, and (3) the absence of clear definitions of what specific marks meant.

In summary, the general causal factors of unreliability have been (1) different bases for assigning marks, (2) variables within the teacher which caused his marks to vary, and (3) differences between teachers.

Studies on the Specific Causal Factors of Unreliability

Numerous studies have been done on the relationship between marks and sex. Ohlson in 1927 (21:90-102), Newton in 1942 (20:72), Swenson in 1943 (31:12-13), Ryan in 1944 (26:557-558), and Carter in 1952 (5:218-228) were among those who reported that girls consistently received significantly higher marks than boys when the marks were assigned by the teacher, but not when the boys and girls were compared as to achievement on a standardized test. Women teachers were reported to have overmarked the girls more often than men teachers, although the men did it too.

In 1954 Hadley reported (12:305-312) that the students who were most-liked by their teachers were usually marked higher than their achievement would justify, while students who were least-liked were usually marked lower than their achievement would justify.

In 1915 Rugg said (25:129) that marks tended to pile

up at the high end of the scale in the upper high school grades and in college because of elimination of the poorer students from the group. He also suggested that certain scores, such as the passing and exempting grades, had a piling up of scores. These factors tended to make the marks unreliable.

Wrinkle stated (37:33-36) in 1947 that the number one fallacy in the use of the letter marks, A B C D F, in reporting student achievement or progress was that anyone could tell from the mark assigned what the student's level of achievement or progress was. He gave evidence that nearly everyone, including the teacher, interpreted these marks differently. He concluded that, of all the functions that school marks were supposed to serve, the only one that had any degree of consistency was motivation of student effort.

In summary, the marks assigned to students by their teachers have varied: (1) because of the sex of both the student and the teacher, (2) because some students were liked by their teachers more than others, (3) because there were cut-off points in the marking scale, and (4) because nobody really knew what a mark meant.

Studies on Teacher Training

Many studies have been done to determine the relationship between student achievement and teacher training. The evidence from these studies was inconclusive as to

whether more training produced higher achievement by the students. Some of the studies showing a positive correlation between teacher training and student achievement are presented first, after which those that showed no correlation or a negative correlation are given.

One of the earliest studies of the relationship between teacher training and student achievement was reported by Rogers in 1924 (23:146). He administered the Monroe silent-reading tests to 166 classes of third, fourth, and fifth grade students. He found that higher reading comprehension generally accompanied increased teacher training.

Another study was that of Hughes in 1925, which involved high school physics teachers and their students. The teachers were grouped according to the number of years of university physics which they had had, and the students were grouped on the basis of intelligence. Three tests were given to measure the achievement of the students, and Hughes reported the following results:

In every test, the pupils who were taught by teachers who had majored in physics made average scores above the mean score of all pupils taking the test. In every test, the pupils who were taught by teachers who had not majored in physics made average scores less than the mean score of all pupils taking the test. (13:294)

In 1933, Davis (6:101) investigated the relationship between teacher training and student success on the Minnesota State Board Tests of Pupil Achievement. Altogether 796 teachers and 13,460 students were included in the study.

Only in chemistry did Davis find that greater teacher training correlated positively with higher student achievement.

Wasylyk reported in 1961 on his study of grade twelve mathematics achievement in Alberta. His study included 257 teachers out of 269, or about 96 per cent of the teachers of grade twelve mathematics in Alberta. He found that there was a positive significant relationship between grade twelve mathematics achievement of the students and the number of university level mathematics courses taken by the teacher (34:74-75). Wasylyk also concluded that:

The student achievement of teachers with five but less than six years of training is significantly higher than that of teachers with less than four years of training, but it is not very much higher than that of teachers with four but less than five years of training. The student achievement of teachers with six or more years of training surpasses that of every other group of teachers. These results indicate that there is a significant positive relation between student achievement in mathematics and the length of the teachers' academic and professional training. (34:74)

He also reported that urban students did much better in relation to their ability, as reported on an ability test, than did the rural students and attributed this to the significantly better professional preparation of the urban teachers. (34:78)

Bergman (2:146), in 1929, was among the first to report evidence contrary to the studies cited above. He used data from about 14,000 students who were involved in the Michigan state cooperative testing program to study the factors which were related to student achievement. He

reported that teacher training had no appreciable influence on student achievement within homogeneous groups of students.

Davis (6:101), cited previously, reported in 1933 that, except for chemistry, the students of teachers who had not had specialized training in the subjects which they taught achieved higher marks on subject-matter achievement tests than did the students of the teachers who had had specialized training.

In 1946, Stephens and Lichenstein (30:694) conducted a study of eighty-six teachers and their fifth grade arithmetic classes in Baltimore. Only teachers who taught the same class throughout the term and only students who had been in attendance continuously during the term were included in the study. The class achievement was determined in relation to mental age and expressed as a class efficiency score, denoted C.E. Stephens and Lichenstein reported that the C.E. scores correlated negatively with the teachers' knowledge of arithmetic.

A study was conducted by Schunert during 1947-48 to determine the relationship between the mathematical achievement of some students and the professional training of their teachers. The sample consisted of 100 secondary schools out of a total of 522 public secondary schools in Minnesota. The schools were classified according to size and type of organization. The study involved 94 teachers of plane geometry and 102 teachers of elementary algebra. There

were 3,919 students included in the study. Schunert found no significant relationship between the mathematics achievement of the students and the amount of university mathematics studied by their teachers. (27:233)

In 1955 Morsh, Burgess, and Smith (18:88) studied 121 instructors of an aircraft mechanics course to determine, if possible, a reliable criterion of instructor effectiveness. Their effectiveness measure was the subject-matter achievement of each instructor's students. They also reported no significant relationship between student achievement and the instructor's knowledge of the subject-matter.

McCall and Krause (16:73) in 1959 studied seventy-three sixth grade teachers from rural and urban schools in North Carolina. They sought a measure of teacher competence by using the combined growth of each student in nine areas, each weighted according to its significance. The students were tested in September and again in May to determine their growth in each of the nine areas. McCall and Krause reported that the teacher's knowledge of the subject-matter showed no correlation with pupil growth ($r = -.06$) and that professional training as a predictor of student growth was only slightly better than drawing names from a hat ($r = .13$).

Lindstedt investigated the competence of grade nine mathematics teachers who were teaching in the schools of Alberta in May, 1958. He sought to determine the relationship among four teacher characteristics (professional

training, professional experience, number of university-level mathematics courses taken, and subject preference for teaching) and student achievement as determined by the Departmental Examinations administered in June, 1958. He found no significant relationship between either the amount of professional training of the teacher or the number of university-level mathematics courses taken by the teacher, and the mathematics achievement of the grade nine students. (15:53)

Studies on Professional Teaching Experience

Professional teaching experience has long been regarded as a major factor in determining the effectiveness of a teacher. Salaries and selection procedures for administrative positions have been based on it. However, the research evidence about teaching experience, like that about teacher training, has been somewhat contradictory, and has thus made the drawing of definite conclusions rather difficult.

Many of the studies of teaching experience and student achievement have been an integral part of studies of teacher training and student achievement. This was true of many of the studies which have already been reviewed here.

The study by Rogers indicated that ". . . higher reading comprehension scores of pupils were in general accompanied by greater teacher experience, up to eight or nine years." (23:146)

The conclusion that teaching experience had no significant influence on student achievement of students in homogeneous groups was reached by Bergman. (2:146)

Davis (6:101) found that, after the first year of teaching experience, little improvement in student achievement was gained as teaching experience of the teacher increased.

Schunert's study of 196 teachers of algebra and geometry and the 3,919 students taught by them supported the following conclusion:

Classes taught by teachers who had more than eight years of experience exceeded the achievement of classes taught by teachers of less experience. No significant difference was found between the achievement of classes taught by teachers of less than two years experience and achievement of classes taught by teachers having from two to eight years of experience. (27:233)

The study by Stephens and Lichenstein of the Baltimore teachers of fifth grade arithmetic concluded that, generally, the class efficiency scores showed a slight positive correlation with teaching experience. The more positive effect of the experience was apparent for the younger teachers. (30:690)

McCall and Krause, in their North Carolina study which measured teacher competence in terms of pupil growth in nine areas, reached the following conclusions about teaching experience and over-all student growth:

Years of service, usually referred to as experience, another customary basis for determining the worth and salary of teachers, showed a zero (-.04) correlation

with merit. This finding is supported by the further fact that young teachers averaged higher criterion scores, or over-all growth in pupils, than did older teachers. (16:73)

More recently, two studies similar in design were conducted by Lindstedt and Wasylyk. Both studies were previously cited in this review.

Lindstedt (15:50-55), in 1960, found a significant relation between teaching experience and student achievement when the length of experience was only one year or when it was ten years or more. Teachers with five to nine years of teaching experience were more effective than teachers with three or four years of experience, but there was no difference in competence between teachers with five to nine years of experience and teachers with less than three years of experience.

Wasylyk, in 1961 reported that there were some significant differences in student achievement as teaching experience increased. He stated:

The student achievement in mathematics of teachers with nine or less years of teaching experience is not significantly different from either that of teachers with ten to nineteen years of experience or that of teachers with thirty-five or more years of experience. However, the student achievement of teachers with ten to nineteen years of experience is significantly higher than that of teachers with thirty-five or more years of experience, and the student achievement of teachers with twenty to thirty-four years of experience surpasses that of each of the other three groups. These results indicate that there is a fairly significant relation between the length of the teachers' experience and the students' achievement in mathematics. (34:75-76)

Wasylyk also reported (34:77) that teacher training

and teaching experience did not function independently in relation to student achievement, but interacted very significantly. Student achievement was greatest for those students whose teachers had large amounts of both training and experience.

These studies report inconsistent results and thus support no definite conclusions.

The studies by other investigators of the relationship between teaching experience and student achievement seem to be no more consistent. In 1929, Moss, Loman, and Hunt (19:40-50) reported that a chemistry test was administered to 6,667 students at the beginning and again at the end of an elementary chemistry course in twenty-eight colleges and universities. Classes were equated on the basis of student intelligence, size, and chemistry background. The teaching competence of the teacher was judged on the adjusted average differences between the students' initial and final marks on the test. The conclusions reached were: (1) The highest median scores were obtained by classes whose teachers had from one to eleven years of teaching experience, and (2) There was a marked decrease in the median scores of students whose teachers had twelve or more years of teaching experience.

Rolfe (24:74) reported in 1945 about the teaching ability of fifty-seven teachers of grades seven and eight in one-room and two-room rural schools in Wisconsin. By

using multiple regression, he adjusted the final students' marks obtained on some tests in citizenship, according to the initial achievement of the students on the same tests, their intelligence, and their socio-economic status. The difference between the predicted average gains and the actual average gains of the pupils was used as an indication of a teacher's proficiency. Rolfe concluded that as teaching experience increased, average pupil gains showed a slight decrease ($r = -.17$).

IV. SUMMARY OF THE CHAPTER

The studies on the reliability of marks reviewed in this chapter have indicated that teacher-given marks were unreliable because: (1) teachers differed from each other, (2) students differed from each other, and (3) a teacher's ability to judge a student's work to assign to him a mark fluctuated. Ayer commented in 1933 that ". . . the same evidence of lack of reliability of teachers' marks appears regardless of the subject, level of instruction, or type of subjectmatter." (1:202)

The studies reviewed here about student achievement and teacher training were inconsistent and support no definite conclusions.

The studies reviewed here about student achievement and teaching experience were somewhat inconsistent. There does seem to have been some support for the idea that a

little teaching experience has increased student achievement.

The writer could find only one study on overmarking in his review of the literature, and that was the study conducted by Black for the Royal Commission on Education in Alberta. All of the other studies seem to have focused on (1) the reliability of the students' marks, (2) the use of students' marks as a measure of teacher effectiveness, or (3) the teachers' professional qualifications as a measure of teacher effectiveness. Perhaps Black was the first to discover a consistent pattern in the unreliability of students' marks, and he thus concluded that overmarking, especially in the smaller high schools, had occurred in Alberta. Because Black's study was not as rigorous as it might have been (pp. 2-3), because the writer was a teacher in one of the smaller high schools of Alberta, and also because the writer had assigned marks to students which were significantly high than their corresponding Departmental Examination marks, Black's allegation of overmarking seemed to be an appropriate field for further investigation. This became more apparent when corroborating research was not found in the literature.

If overmarking was in fact occurring in the high schools of Alberta, then it would seem that reasons which would account for this should be sought. Four factors which could have affected the students' marks were selected, and these were attendance at school, class size, teacher

training, and teaching experience. Teacher training and teaching experience have been rather thoroughly researched as factors affecting both the reliability of marks and teacher competence, but no research was found in the literature about their effect on overmarking. This was therefore an appropriate area for research. Some of the studies reviewed here used the correlation coefficient as an indicator of the degree to which teacher training and teaching experience affected either students' marks or teacher competence. In addition, there were some studies, such as Wasylyk's, which segmented teacher training and teaching experience into parts to determine optimum amounts of each for greatest student achievement. The present study has used the correlation coefficient as an indicator of the degree to which teacher training and teaching experience have affected students' marks, but no attempt has been made to determine optimum amounts of either for maximum or minimum amounts of overmarking.

The writer could not find any studies reported in the literature on the relationship between either class size and overmarking or class size and student achievement. Similarly, there was no reported research found on attendance and either overmarking or student achievement. This dearth of reported research seems to imply that in the past, investigators have not considered either class size or attendance as significant variables affecting student achievement.

Since both may be significant, these were also regarded as areas for research. This study has attempted to do two things with attendance and class size. These are to determine whether or not each is related to overmarking, and whether or not each is related to students' marks. The design of this study is not suited to an investigation of the problem of determining optimum class size for maximum student achievement.

CHAPTER III

THE DATA, THE ANALYSIS, AND INTERPRETATIONS

I. DATA ON STUDENTS

In September, 1965, the Department of Education, Province of Alberta, drew a stratified random sample from the entire provincial grade twelve population of 1964-65. This was done by drawing a number at random to determine the first student to be selected from the first twenty-five students in the Department's list of students. Student number eleven was so drawn, and thereafter every twenty-fifth student in the list was then drawn. This procedure resulted in 872 students being included in the Department's sample. This sample served as the starting point for determining the sample used in the present study.

Next the marks in Mathematics 20 and 30, Language 20 and English 30, and Social Studies 20 and 30 were obtained for these students from the Department's records. Any student who did not write at least one Subject 20 examination in 1964 and the corresponding Subject 30 examination in 1965 was then dropped from the sample, as were also the students who had studied in private schools, and those who had studied in schools which were on the semester system. Finally, those students who could not be matched with their teachers, except for those from the City of Edmonton (p. 10), were also dropped from the sample. Then, because of the

small number involved, all 110 students who took the above subjects in the small high schools were added, giving a total of 456 students to be included in the sample for this study.

The 456 students represented the following: 110 were from small high schools, 79 were from medium high schools, 98 were from large rural high schools, 75 were from large high schools in the City of Calgary, and 94 were from large high schools in the City of Edmonton. (Neither Edmonton nor Calgary had any small or medium high schools as defined in this study.)

The number of students in the sample with complete data in each subject area for each school category is presented in Table I.

TABLE I

NUMBER OF STUDENTS WITH COMPLETE DATA IN EACH
SUBJECT AREA FOR EACH SCHOOL CATEGORY

	Small	Medium	Large Rural	Large Calgary	Large Edmonton	Totals
Mathematics	53	47	56	50	63	269
English	73	60	72	64	84	353
Social Studies	98	67	78	49	90	382
						1004
Total Number of Students	110	79	98	75	94	456

There were 269 mathematics students, 353 English students, and 382 social studies students included in this study. Also, since there were only 456 different students included in this study, it is quite apparent that many students wrote examinations in more than one of the subject areas.

The 269 mathematics students represent 11,055 students who were enrolled in Mathematics 30 in 1964-65 and 13,356 students who were enrolled in Mathematics 20 in 1963-64. The 353 English students represent 13,165 students who were enrolled in English 30 in 1964-65 and 19,875 students who were enrolled in Language 20 in 1963-64. The 382 social studies students represent 15,047 students who were enrolled in Social Studies 30 in 1964-65 and 19,586 students who were enrolled in Social Studies 20 in 1963-64. (Source: the 1963 and 1964 Form A Cards of the Department of Education.)

II. DATA ON TEACHERS

The names of the teachers were obtained from the Form A Cards of the Department of Education. For schools which had only one teacher of a Subject 20 or 30, that teacher was matched with the students from that school. For schools which had more than one teacher of a subject, the principals of the schools were asked to identify each student with his teachers. When this source failed to supply the necessary information, the students were asked to supply

the names of their teachers. These sources failed to supply the names of the teachers for only twelve students from large rural high schools and eight students from large Calgary high schools. These students were dropped from the study, as was previously indicated.

There were so few students from Edmonton who could be matched with their teachers that either all students from Edmonton had to be dropped from the study, or else be included but without the information about their teachers. The latter alternative was chosen rather than lose all the information about the ninety-four students from Edmonton.

There was a total of 907 teachers included in this study. The number of teachers of each subject for each school category is presented in Table II.

TABLE II
NUMBER OF TEACHERS OF EACH SUBJECT
FOR EACH SCHOOL CATEGORY

	School Category					Totals
	Small	Medium	Large Rural	Large Calgary	Large Edmonton	
Math. 20	11	48	44	27	-	130
Math. 30	11	48	40	25	-	124
Lang. 20	13	58	53	41	-	165
Eng. 30	13	58	50	34	-	155
Soc. St. 20	15	70	55	32	-	172
Soc. St. 30	15	70	54	22	-	161
						907

The average class size for each teacher was determined from the Form A Cards. This was done by dividing the total school enrollment reported for a subject by the number of classes of that subject which were taught in the school.

The number of years of university training and the number of years of teaching experience of each teacher were supplied by the Alberta Teachers Association. This information was taken from the 1963-64 School Opening Report for the Subject 20 teachers, and the 1964-65 School Opening Report for the Subject 30 teachers. These reports were submitted by each teacher at the beginning of each school year and a copy of each was retained by the Alberta Teachers Association.

III. MEANS OF VARIOUS FACTORS

In order to make it easy to compare means, the means of the various factors investigated in this study are presented in Tables III, IV, and V for each school category in each subject. Data from these tables were used in the analysis which follows.

TABLE III

MEANS OF ATTENDANCE, MARKS, CLASS SIZE, YEARS OF PROFESSIONAL TRAINING,
AND YEARS OF TEACHING EXPERIENCE FOR MATHEMATICS
ACCORDING TO HIGH SCHOOL CATEGORY

School Category	Math. 20 Attendance	Math. 30 Attendance	Teacher- Given Math. 20 Marks	Teacher- Given Math. 30 Marks	Dept. Math. 30 Marks	Math. 20 Ave. Class Size	Math. 30 Ave. Class Size	Math. 20 Professional Training	Math. 30 Professional Training	Math. 20 Teaching Experience	Math. 30 Teaching Experience
Small	179	177	65.6	60.0	50.5	11.9	9.4	5.1	5.5	14.8	16.1
Medium	177	178	63.4	54.7	51.9	17.7	13.7	4.8	5.6	15.5	17.9
Large Rural	180	179	66.4	54.7	55.2	26.0	25.7	4.8	6.0	18.2	19.2
Large Calgary	182	184	63.9	54.4	55.8	31.3	30.3	5.1	5.7	15.2	18.3
Large Edmonton	182	179	63.2	56.0	54.9	33.0	31.8	-	-	-	-
	Days	Days	%	%	%	Pupils	Pupils	Years	Years	Years	Years

TABLE IV

MEANS OF ATTENDANCE, MARKS, CLASS SIZE, YEARS OF PROFESSIONAL TRAINING,
AND YEARS OF TEACHING EXPERIENCE FOR ENGLISH
ACCORDING TO HIGH SCHOOL CATEGORY

School Category	Lang. 20 Attendance	Eng. 30 Attendance	Teacher- Given Lang. 20 Marks	Teacher- Given Eng. 30 Marks	Dept. Eng. 30 Marks	Lang. 20 Class Size	Eng. 30 Class Size	Lang. 20 Prof. Tr.	Eng. 30 Prof. Tr.	Lang. 20 Tea. Exp.	Eng. 30 Tea. Exp.
Small	177	175	64.7	59.5	54.6	16.8	9.6	4.4	4.9	15.9	20.2
Medium	177	177	65.4	58.4	57.1	21.9	17.9	4.3	5.6	14.9	18.7
Large Rural	180	178	64.9	59.3	60.6	25.8	25.4	4.6	5.6	14.3	16.2
Large Calgary	180	183	64.9	57.7	59.9	32.1	31.1	4.8	6.0	11.3	17.9
Large Edmonton	181	179	65.1	59.5	62.3	32.7	31.0	-	-	-	-
	Days	Days	%	%	%	Pupils	Pupils	Years	Years	Years	Years

TABLE V

MEANS OF ATTENDANCE, MARKS, CLASS SIZE, YEARS OF PROFESSIONAL TRAINING,
AND YEARS OF TEACHING EXPERIENCE FOR SOCIAL STUDIES
ACCORDING TO HIGH SCHOOL CATEGORY

School Category	Soc. St. 20 Attendance	Soc. St. 30 Attendance	Teacher- Given Soc. St. 20 Marks	Teacher- Given Soc. St. 30 Marks	Dept. Soc. St. 30 Marks	Soc. St. 20 Class Size	Soc. St. 30 Class Size	Soc. St. 20 Prof. Tr.	Soc. St. 30 Prof. Tr.	Tea. Exp.	Soc. St. 20 Tea. Exp.	Soc. St. 30 Tea. Exp.
Small	177	174	62.0	56.2	51.4	17.6	11.5	3.9	4.3	15.6	18.8	18.0
Medium	176	176	61.3	54.8	53.8	21.2	18.3	4.4	5.4	15.4	18.0	18.0
Large Rural	179	177	64.1	56.9	57.4	24.9	24.4	4.7	5.6	11.4	16.9	16.9
Large Calgary	180	183	63.2	54.4	60.1	31.9	32.2	4.6	5.8	10.2	17.8	17.8
Large Edmonton	181	178	63.3	56.3	56.5	29.8	31.2	-	-	-	-	-
	Days	Days	%	%	%	Pupils	Pupils	Years	Years	Years	Years	Years

IV. ANALYSIS OF THE DATA

The analysis is presented as it applied to each of the five problems investigated in this study. The problem is stated in each case, and it is followed by the relevant analyses and interpretations.

QUESTION 1. DID ANY OVERMARKING OCCUR IN MATHEMATICS, ENGLISH, OR SOCIAL STUDIES IN ANY OF THE SCHOOL CATEGORIES, AND IF SO, TO WHAT EXTENT?

The answer to this question was sought through the use of the correlation coefficient, r , the multiple correlation coefficient, R , multiple regression analysis, and analysis of variance.

Mathematics

The following correlation coefficients were calculated for each of the five school categories: Mathematics 20 marks vs teacher-given Mathematics 30 marks, Mathematics 20 marks vs Departmental Mathematics 30 marks, and teacher-given Mathematics 30 marks vs Departmental Mathematics 30 marks. These are reported in Table VI.

TABLE VI
CORRELATION COEFFICIENTS BETWEEN MATHEMATICS
MARKS FOR FIVE SCHOOL CATEGORIES

		School Category				
		Small	Medium	Large Rural	Large Calgary	Large Edmonton
N	=	53	47	56	50	63
Math. 20 vs Teacher-given Mathematics 30		.70	.64	.65	.83	.76
Math. 20 vs Departmental Math. 30		.71	.60	.69	.78	.72
Tea.-given Math. 30 vs Dept. Math. 30		.72	.75	.82	.82	.76

Each correlation coefficient, r , in Table VI was tested for significance at the .05 or .01 level by using a t -test. The null hypothesis was $H_0: r = 0$, and in each case the null hypothesis was rejected. Each r was significantly different from zero at the .01 level.

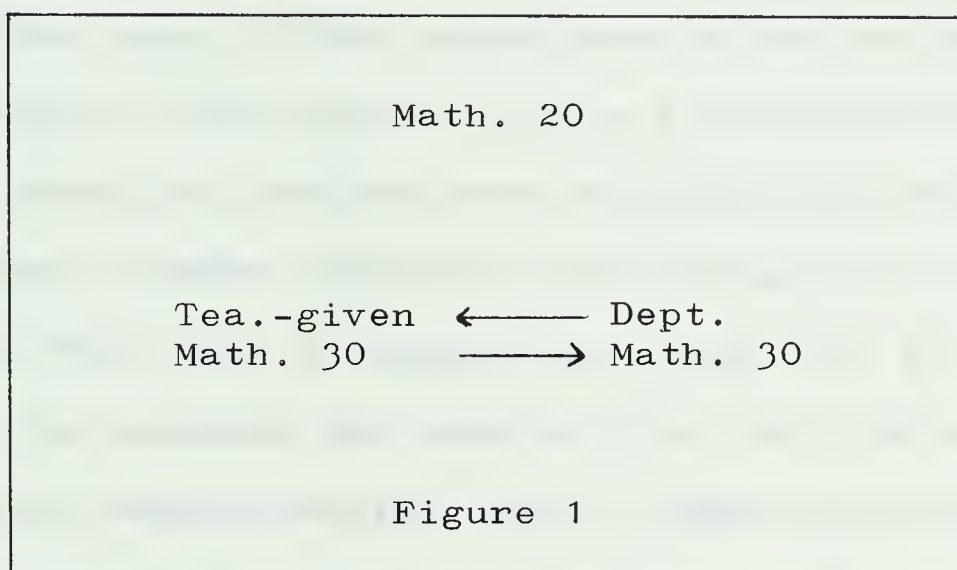
Next the three r 's for each school category were tested for significant differences between pairs at the .05 or .01 level by using a t -test for correlated samples. (10:154) The null hypothesis was $H_0: r_1 = r_2$ for each pair. For the small, medium, and large high schools in both

Calgary and Edmonton, there was not sufficient evidence to warrant rejection of the null hypothesis. Therefore, for each of these school categories, the three r 's were not significantly different from each other.

The null hypothesis was rejected for the large rural high schools. Therefore, the three correlation coefficients for these high schools did show some significant differences. At the .01 level, .65 and .82 were significantly different. Teacher-given Mathematics 30 marks correlated better with Departmental Mathematics 30 marks than they did with Mathematics 20 marks. At the .05 level, .69 and .82 were significantly different. Departmental Mathematics 30 marks correlated better with teacher-given Mathematics 30 marks than they did with Mathematics 20 marks. There was no significant difference between .65 and .69. Mathematics 20 marks correlated equally well with both teacher-given and Departmental Mathematics 30 marks.

Since each of these three mathematics marks is a predictor of the other two, and since a significantly higher correlation coefficient indicates better prediction, then teacher-given Mathematics 30 marks predicted Departmental Mathematics 30 marks better than they predicted Mathematics 20 marks, Departmental Mathematics 30 marks predicted teacher-given Mathematics 30 marks better than they predicted Mathematics 20 marks, and Mathematics 20 marks predicted Departmental Mathematics 30 marks and teacher-given

Mathematics 30 marks about equally well. This prediction is represented diagrammatically in Figure 1. Arrows are drawn from the predictors to the marks which were better predicted. Since Mathematics 20 marks predicted the other two mathematics marks equally well, no arrows are drawn from it to the other two.



Next the r 's of the five school categories were tested for significant differences among them at the .05 or .01 level using Fisher's z_r transformations on pairs in each row of Table VI. (10:153) The null hypothesis in each case was $H_0: r_1 = r_2$. There was not sufficient evidence to warrant rejection of the null hypothesis for any pair of r 's between Mathematics 20 marks and Departmental Mathematics 30 marks, or between teacher-given Mathematics 30 marks and Departmental Mathematics 30 marks. For these two rows of r 's the samples from the five school categories may be considered as random samples from a common population. However,

there was sufficient evidence to reject the null hypothesis for two pairs of r 's between Mathematics 20 marks and teacher-given Mathematics 30 marks. At the .05 level, .64 and .83 were significantly different as were also .65 and .83. Therefore, the samples from the medium, large rural, and large Calgary high schools may not be considered as random samples from a common population.

On the basis of the comparison of r 's in the three rows of Table VI there appears to be a contradiction. For two of the rows the samples were considered as random samples from a common population and for one row they were not. Since the level of significance was .05, it is probably safe to consider the samples from the five school categories as random samples from a common population. Further evidence is needed before a definite conclusion can be drawn.

The multiple correlation coefficient, R , was determined for each school category with Departmental Mathematics 30 marks as the criterion and the following as predictors: attendance in Mathematics 20, attendance in Mathematics 30, Mathematics 20 mark, teacher-given Mathematics 30 mark, number of years of university training of the Mathematics 20 teacher, number of years of university training of the Mathematics 30 teacher, number of years of teaching experience of the Mathematics 20 teacher, number of years of teaching experience of the Mathematics 30 teacher,

Mathematics 20 class size, and Mathematics 30 class size. Through multiple regression analysis the predictors were successively added, and at each step the increase in prediction was tested for significance at the .05 or .01 level by using a t-test. The R's for each school category appear in Table VII along with the predictors in the order in which they were added. Only those predictors which significantly added to the prediction of the criterion are included in Table VII.

Teacher-given Mathematics 30 marks were the most significant predictor of Departmental Mathematics 30 marks in each of the school categories. Mathematics 20 marks were the second most significant predictor of the criterion in three school categories. Mathematics 20 marks were not a significant predictor only in the medium high schools.

The means of the three sets of mathematics marks for each school category were next tested for significant differences by using analysis of variance. F was significant at the .01 level for each school category.

TABLE VII

SUCCESSIVE MULTIPLE R's WITH DEPARTMENTAL MATHEMATICS 30
MARKS AS CRITERION AND VARIOUS FACTORS
AS PREDICTORS

School Category	Predictors with Multiple R's			
Small	Teacher-given Math. 30 marks R = .72	Mathematics 20 marks R = .78	Mathematics 20 Class Size R = .83	University Training of Math. 20 Teacher R = .85
Medium	Teacher-given Math. 30 marks R = .75	Mathematics 20 Class Size R = .79	Mathematics 20 Attendance R = .80	
Large Rural	Teacher-given Math. 30 marks R = .82	Mathematics 20 marks R = .85	University Tr. of Math. 20 Teacher R = .86	
Large Calgary	Teacher-given Math. 30 marks R = .82	Teaching Exp of Math. 30 Teacher R = .84	Math. 20 Class Size R = .86	University Tr. of Math. 30 Tea. R = .88 R = .89
Large Edmonton	Teacher-given Math. 30 marks R = .76	Mathematics 20 marks R = .79	Mathematics 20 Class Size R = .81	

Next the means were tested to determine where the significant differences were by using the Newman-Keuls method for testing the differences among ordered means (35:80-85). This test revealed a significant difference between the Mathematics 20 mean and the Departmental Mathematics 30 mean for the small, medium, large rural, and large Edmonton high schools at the .01 level and for large Calgary high schools at the .05 level. In each case the Mathematics 20 mean was larger than the corresponding Departmental Mathematics 30 mean. This test also revealed a significant difference at the .01 level between the teacher-given Mathematics 30 mean and the Departmental Mathematics 30 mean for the small high schools only. Here also, the teacher-given Mathematics 30 mean was larger than the Departmental Mathematics 30 mean.

The means of the mathematics marks are given in Table VIII.

TABLE VIII
MEANS OF THE MATHEMATICS MARKS
FOR FIVE SCHOOL CATEGORIES

	School Category				
	Small	Medium	Large Rural	Large Calgary	Large Edmonton
Math. 20	65.6	63.4	66.4	63.9	63.2
Tea.-given Math. 30	60.0	54.7	54.7	54.4	56.0
Dept. Math. 30	50.5	51.9	55.2	55.8	54.9

The means of the Mathematics 20 marks for the five school categories were tested for significant differences among them at the .05 or .01 level by using analysis of variance. The null hypothesis was $H_0: m_1 = m_2 = m_3 = m_4 = m_5$, that is, the samples from the five school categories were random samples drawn from a common population. F was not significant at the .05 level; therefore, the null hypothesis was not rejected. The means of the five school categories in Mathematics 20 were not significantly different.

The means of the teacher-given Mathematics 30 marks and the Departmental Mathematics 30 marks were similarly tested. In each case there was not sufficient evidence to warrant rejection of the null hypothesis at the .05 level. Therefore the means of the teacher-given Mathematics 30

marks were not significantly different. Similarly, the means of the Departmental Mathematics 30 marks were not significantly different. Therefore, the mathematics samples from the five school categories may be considered as random samples from a common population.

English

The following correlation coefficients were calculated for each of the five school categories: Language 20 marks vs teacher-given English 30 marks, Language 20 marks vs Departmental English 30 marks, and teacher-given English 30 marks vs Departmental English 30 marks. These are reported in Table IX. Each correlation coefficient, r , was tested for significance at the .05 or .01 level by means of a t -test. The null hypothesis was $H_0: r = 0$, and in each case the null hypothesis was rejected. Each r was significantly different from zero at the .01 level.

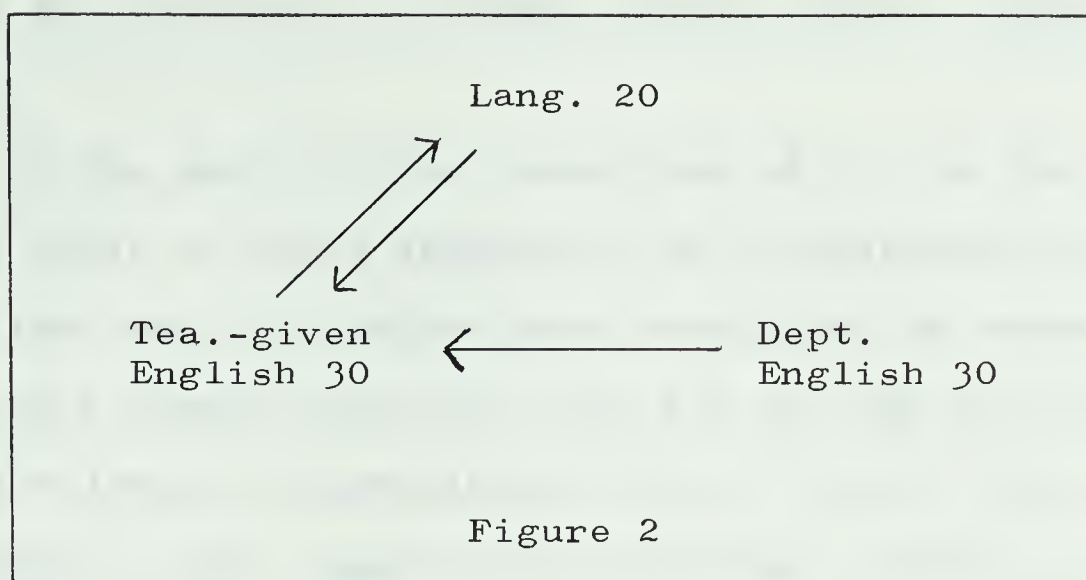
TABLE IX
CORRELATION OF COEFFICIENTS BETWEEN ENGLISH
MARKS FOR FIVE SCHOOL CATEGORIES

		School Category				
		Small	Medium	Large Rural	Large Calgary	Large Edmonton
N	=	73	60	72	64	84
Lang. 20 vs Tea.-given English 30		.74	.70	.79	.84	.63
Lang. 20 vs Departmental English 30		.69	.70	.57	.60	.69
Tea.-given Eng. 30 vs Dept. Eng. 30		.71	.66	.67	.71	.72

Next the three r 's for each school category were tested for significant differences between pairs at the .05 or .01 level by means of a t -test. (10:154) The null hypothesis for each pair was $H_0: r_1 = r_2$. For the small, medium, and large Edmonton high schools there was not sufficient evidence to warrant rejection of the null hypothesis. Therefore, for each of these three school categories the three r 's were not significantly different. The null hypothesis was rejected for the large rural and large Calgary high schools.

The three r 's for the large rural high schools did have some significant differences among them. At the .01 level, .79 and .57 were significantly different. Language 20 marks correlated better with teacher-given English 30 marks than they did with Departmental English 30 marks. There were no other significant differences between the r 's in this school category.

The three correlation coefficients for the large Calgary high schools all differed significantly. At the .01 level .84 and .60 differed significantly. Language 20 marks correlated better with teacher-given English 30 marks than they did with Departmental English 30 marks. At the .05 level, .84 and .71 differed significantly. Teacher-given English 30 marks correlated better with Language 20 marks than they did with Departmental English 30 marks. Also, .60 and .71 differed significantly at the .05 level. Departmental English 30 marks correlated better with teacher-given English 30 marks than they did with Language 20 marks. Language 20 marks and teacher-given English 30 marks were better predictors of each other than either were of Departmental English 30 marks. This prediction is represented diagrammatically in Figure 2. Arrows are drawn between pairs where better prediction occurred.



Next the r 's of the five school categories were tested for significant differences among them at the .05 or .01 level using Fisher's z_r transformations on pairs in each row of Table IX. (10:153) The null hypothesis in each case was $H_0: r_1 = r_2$. There was not sufficient evidence to warrant rejection of the null hypothesis for any pair of r 's between Language 20 marks and Departmental English 30 marks, or between teacher-given English 30 marks and Departmental English 30 marks. For these two rows of r 's the samples from the five school categories may be considered as random samples from a common population. However, there was sufficient evidence to reject the null hypothesis for two pairs of r 's between Language 20 and teacher-given English 30 marks. At the .01 level, .84 and .63 were significantly different, and at the .05 level, .79 and .63 were also significantly different. Therefore, the samples from the large rural, large Calgary, and large Edmonton high schools

may not be considered as random samples from a common population.

On the basis of the comparison of r 's in the three rows of Table IX there appears to be a contradiction. For two of the rows the samples were considered as random samples from a common population and for one row they were not. Since the level of significance was .01 in one case, there is probably a real significant difference between the samples. Further evidence is necessary before a conclusive decision can be made.

Next the multiple correlation coefficient, R , was determined for each school category with Departmental English 30 marks as the criterion and the following as predictors: attendance in Language 20, attendance in English 30, Language 20 mark, teacher-given English 30 mark, number of year of university training of the Language 20 teacher, number of years of university training of the English 30 teacher, number of years of teaching experience of the Language 20 teacher, number of years of teaching experience of the English 30 teacher, Language 20 class size, and English 30 class size. Through multiple regression analysis the predictors were successively added, and at each step the increase in prediction was tested for significance at the .05 or .01 level. The R 's for each school category appear in Table X along with the predictors in the order in which they were added. Only those predictors which

significantly added to the prediction of the criterion are included in Table X.

Teacher-given English 30 marks were the most significant predictor of Departmental English 30 marks in four of the school categories, and the second most significant in the other -- the medium high schools. Language 20 marks were the most significant predictor in the medium high schools and the second most significant in the small and large Edmonton high schools. Language 20 marks were not a significant predictor of the criterion in either large rural or large Calgary high schools.

The means of the three sets of English marks for each school category were tested for significant differences among them by using analysis of variance. F was significant at the .01 level for the small, medium, large rural, and large Edmonton high schools, and at the .05 level for large Calgary high schools.

TABLE X

SUCCESSIVE MULTIPLE R's WITH DEPARTMENTAL ENGLISH 30
MARKS AS CRITERION AND VARIOUS FACTORS
AS PREDICTORS

School Category	Predictors with Multiple R's	
Small	Teacher-given English 30 marks R = .71	Language 20 marks R = .75 University Training of Eng. 30 Teacher R = .78
Medium	Language 20 marks R = .70	Teacher-given English 30 marks R = .74 Language 20 Class Size R = .76
Large Rural	Teacher-given English 30 marks R = .67	University Training of Lang. 20 Teacher R = .69
Large Calgary	Teacher-given English 30 marks R = .71	University Training of Eng. 30 Teacher R = .73
Large Edmonton	Teacher-given English 30 marks R = .72	Language 20 marks R = .78 Language 20 Attendance R = .79

Next the means were tested to determine where the significant differences were by using the Newman-Keuls method. (35:80-85) This test revealed a significant difference at the .01 level between the Language 20 mean and the Departmental English 30 mean for the small and medium high schools. In each case the Language 20 mean was larger than the Departmental English 30 mean. There was not a significant difference between the Language 20 mean and the Departmental English 30 mean for any of the other three school categories. This test also revealed a significant difference at the .05 level between the teacher-given English 30 mean and the Departmental English 30 mean for the small high schools. The teacher-given English 30 mean was larger than the Departmental English 30 mean. In the other four school categories these means were not significantly different.

The means of the English marks are given in Table XI.

TABLE XI
MEANS OF THE ENGLISH MARKS FOR
FIVE SCHOOL CATEGORIES

	School Category				
	Small	Medium	Large Rural	Large Calgary	Large Edmonton
Lang. 20	64.7	65.4	64.9	64.9	65.1
Tea.-given English 30	59.5	58.4	59.3	57.7	59.5
Dept. English 30	54.6	57.1	60.6	59.9	62.3

The means of the Language 20 marks for the five school categories were tested for significant differences among them at the .05 or .01 level using analysis of variance. The null hypothesis was $H_2: m_1 = m_2 = m_3 = m_4 = m_5$, that is, the samples were random samples from a common population. There was not sufficient evidence to warrant rejection of the null hypothesis at the .05 level. Therefore, the means of the five school categories in Language 20 were not significantly different.

The means of the teacher-given English 30 marks were similarly tested and again the null hypothesis was not rejected at the .05 level. Therefore, the means of the five school categories for teacher-given English 30 marks were not significantly different. On the basis of this evidence,

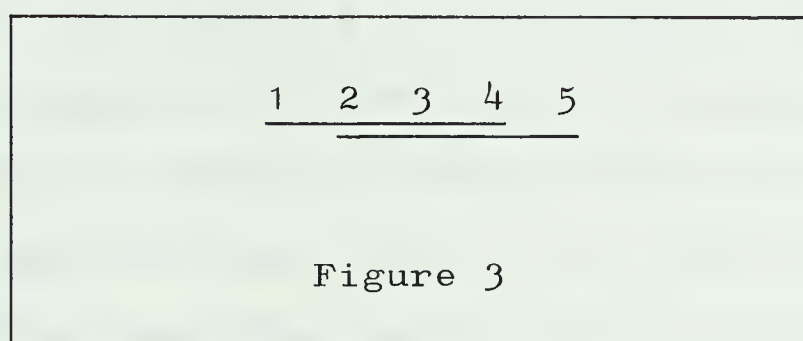
the samples from the five school categories may be considered as random samples from a common population.

The means of the Departmental English 30 marks were also tested in a similar manner. Here the null hypothesis was rejected at the .01 level. There were significant differences among the means. To determine which means were significantly different, the Newman-Keuls method was again used. This test revealed a significant difference at the .05 level between the means of the small high schools and the large Edmonton high schools.

On the basis of the above evidence, the samples from the five school categories may not be considered as random samples from a common population. Here again, as with the comparison of r 's (p. 46), there appears to be a contradiction. The samples from the five school categories appear to be random samples from a common population when Language 20 and teacher-given English 30 marks are considered, but not when Departmental English 30 marks are considered. In the comparison of r 's, the significant differences appeared to be among the three large school categories. In the comparisons of the means, the significant difference appears to be between the small high schools and the large Edmonton high schools.

When the four school categories without large Edmonton high schools were considered, the means did not differ significantly at the .05 level. Similarly, when the four

school categories without the small high schools were considered, there were no significant differences among the means of the Departmental English 30 marks. This is represented diagrammatically in Figure 3 by numbering the means from lowest to highest, and then drawing a line under the numbers of the means where there were no significant differences.



Even though mean "1" and mean "5" differed significantly, neither differed significantly from the large portion of the population represented by means "2", "3", and "4".

On the basis of the foregoing analysis, it is apparent that there were some significant differences among the English marks in the samples from the five school categories. The evidence is not consistent enough to identify the differences with any great degree of certainty.

Social Studies

The following correlation coefficients were calculated for each of the five school categories: Social Studies 20 marks vs teacher-given Social Studies 30 marks, Social Studies 20 marks vs Departmental Social Studies 30 marks,

and teacher-given Social Studies 30 marks vs Departmental Social Studies 30 marks. These are reported in Table XII. Each correlation coefficient, r , was tested for significance at the .05 or .01 level by means of a t -test. The null hypothesis was $H_0: r = 0$, and in each case the null hypothesis was rejected. Each r was significantly different from zero at the .01 level.

Next the three r 's for each school category were tested for significant differences between pairs at the .05 or .01 level by means of a t -test for correlated samples. The null hypothesis was $H_0: r_1 = r_2$ for each pair. For the medium and the three large school categories there was not sufficient evidence to warrant rejection of the null hypothesis. Therefore, for each of these four school categories the three r 's were not significantly different from each other.

The null hypothesis was rejected for the small high schools. Therefore, the three r 's did show some significant differences in this school category. At the .05 level, .81 was significantly different from .73. Social Studies 20 marks correlated better with Departmental Social Studies 30 marks than teacher-given Social Studies 30 marks did. There were no other significant differences among the r 's in this school category.

TABLE XII
CORRELATION COEFFICIENTS BETWEEN SOCIAL STUDIES
MARKS FOR FIVE SCHOOL CATEGORIES

		School Category				
		Small	Medium	Large Rural	Large Calgary	Large Edmonton
N	=	98	67	78	49	90
Soc. St. 20 vs Tea.-given Soc. St. 30		.77	.76	.76	.67	.80
Soc. St. 20 vs Departmental Soc. St. 30		.81	.75	.78	.59	.75
Tea.-given Soc. St. 30 vs Dept. Soc. St. 30		.73	.83	.79	.67	.81

Next the r 's of the five school categories were tested for significant differences among them using Fisher's z_r transformations on pairs in each row of Table XII. (10:153) The null hypothesis in each case was $H_0: r_1 = r_2$. There was not sufficient evidence to warrant rejection of the null hypothesis for any pair of r 's between Social Studies 20 marks and teacher-given Social Studies 30 marks, or between teacher-given Social Studies 30 marks and Departmental Social Studies 30 marks. For these two rows of r 's the samples from the five school categories may be considered as

random samples from a common population. However, there was sufficient evidence to reject the null hypothesis for two pairs of r 's between Social Studies 20 marks and Departmental Social Studies 30 marks. At the .05 level, .81 and .59 differed significantly, as also did .78 and .59. Therefore, the samples from the small, large rural, and Calgary high schools may not be considered as random samples from a common population.

On the basis of the above comparison of the r 's in the three rows of Table XII there appears to be a contradiction. For two of the rows the samples from the five school categories were considered as random samples from a common population and for one row they were not. Since the level of significance was .05 in each case, more evidence is required before any definite conclusions are drawn.

Next the multiple correlation coefficient, R , was determined for each school category with Departmental Social Studies 30 marks as criterion and the following as predictors: attendance in Social Studies 20, attendance in Social Studies 30, Social Studies 20 mark, teacher-given Social Studies 30 mark, number of years of university training of the Social Studies 20 teacher, number of years of university training of the Social Studies 30 teacher, number of years of teaching experience of the Social Studies 20 teacher, number of years of teaching experience of the Social Studies 30 teacher, Social Studies 20 class size,

and Social Studies 30 class size. Through multiple regression analysis the predictors were successively added, and at each step the increase in prediction was tested for significance at the .05 or .01 level. The R's for each school category appear in Table XIII along with the predictors in the order in which they were added. Only those predictors which significantly added to the prediction of the criterion are included in Table XIII.

Teacher-given Social Studies 30 marks were the most significant predictor of Departmental Social Studies 30 marks in four of the school categories, and the second most significant predictor in the other one -- the small high schools. Social Studies 20 marks were the most significant predictor of the criterion in the small high schools and the second most significant in the three other school categories -- medium, large rural, and large Edmonton high schools. Social Studies 20 marks were also a significant predictor in the large Calgary high schools, but ranked fourth in order of significance.

The means of the three sets of Social Studies marks for each school category were next tested for significant differences among them by using analysis of variance. F was significant at the .01 level for each school category.

Next the means were tested to determine where the significant differences were by using the Newman-Keuls method. (35:80-85) This test revealed a significant

TABLE XIII

SUCCESSIVE MULTIPLE R's WITH DEPARTMENTAL SOCIAL STUDIES 30
MARKS AS CRITERION AND VARIOUS FACTORS
AS PREDICTORS

School Category	Predictors with Multiple R's			
Small	Soc. Studies 20 marks R = .81	Teacher-given Soc. St. 30 marks R = .83	Univ. Training of Soc. St. 30 Tea. R = .84	University Training of Soc. St. 20 Tea. R = .84
Medium	Teacher-given Soc. St. 30 marks R = .83	Soc. St. 20 marks R = .85	Soc. St. 30 Class Size R = .85	
Large Rural	Teacher-given Soc. St. 30 marks R = .79	Soc. St. 20 marks R = .84	Univ. Training of Soc. St. 20 Tea. R = .85	Social Studies 30 Attendance R = .85
Large Calgary	Teacher-given Soc. St. 30 marks R = .67	Soc. St. 30 Class Size R = .72	Soc. St. 20 Class Size R = .73	Soc. St. 20 marks R = .76
Large Edmonton	Teacher-given Soc. St. 30 marks R = .81	Soc. St. 20 marks R = .83	Soc. St. 30 Attendance R = .83	

difference at the .01 level between the Social Studies 20 mean and the Departmental Social Studies 30 mean for the small, medium, large rural, and large Edmonton high schools. In each case the Social Studies 20 mean was larger than the corresponding Departmental Social Studies mean. There was no significant difference between these means for the large Calgary high schools. This test also revealed a significant difference at the .05 level between the teacher-given Social Studies 30 mean and the Departmental Social Studies 30 mean for both small and large Calgary high schools. The teacher-given Social Studies 30 mean was larger than the Departmental Social Studies 30 mean for the small high schools, but in the large Calgary high schools, the teacher-given Social Studies 30 mean was smaller than the Departmental Social Studies 30 mean. In the medium, large rural, and large Edmonton high schools the teacher-given Social Studies 30 means and the Departmental Social Studies 30 means were not significantly different. The means of the Social Studies marks are given in Table XIV.

TABLE XIV
MEANS OF THE SOCIAL STUDIES MARKS
FOR FIVE SCHOOL CATEGORIES

	School Category				
	Small	Medium	Large Rural	Large Calgary	Large Edmonton
Soc. St. 20	62.0	61.3	64.1	63.2	63.3
Tea.-given Soc. St. 30	56.2	54.8	56.9	54.4	56.3
Dept. Soc. St. 30	51.4	53.8	57.4	60.1	56.5

The means of the Social Studies 20 marks for the five school categories were tested for significant differences among them at the .05 or .01 level using analysis of variance. The null hypothesis was $H_0: m_1 = m_2 = m_3 = m_4 = m_5$, that is, the samples were random samples from a common population. There was not sufficient evidence to warrant rejection of the null hypothesis at the .05 level. Therefore, the means of the five school categories in Social Studies 20 were not significantly different.

The means of the teacher-given Social Studies 30 marks were similarly tested and again the null hypothesis was not rejected at the .05 level. Therefore, the means of the five school categories in teacher-given Social Studies 30 marks were not significantly different. On the basis of

this evidence, the samples from the five school categories may be considered as random samples from a common population.

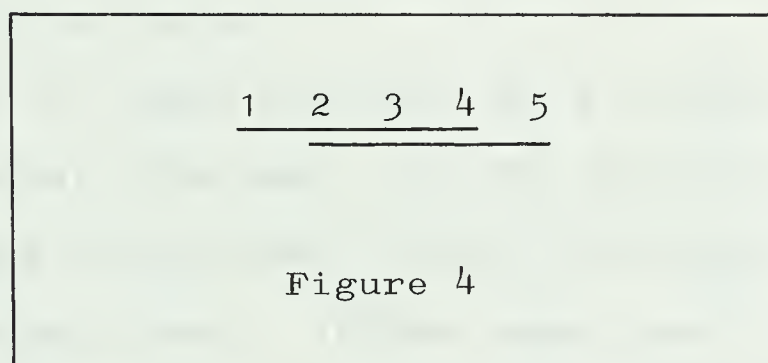
The means of the Departmental Social Studies marks were also tested in a similar manner. Here the null hypothesis was rejected at the .01 level. There were significant differences among the means. To determine which means were significantly different, the Newman-Keuls method was again used. This test revealed a significant difference at the .01 level between the means of the small high schools and the large Calgary high schools for Departmental Social Studies 30 marks. On the basis of this evidence, the samples from the five school categories may not be considered as random samples from a common population.

Here again, as with the comparison of r 's, (pp. 56-57) there appears to be a contradiction. For the means of the Social Studies 20 and the teacher-given Social Studies 30 marks, the samples from the five school categories may be considered as random samples from a common population, but for the means of the Departmental Social Studies 30 marks the samples may not be so considered.

The significant difference revealed by the comparison of r 's is at least partially confirmed by the significant difference between the means. In the comparison of r 's, the significant differences were between the small and the large Calgary high schools, and also between the large rural and the large Calgary high schools. In the analysis

of variance, the significant difference was between the small and the large Calgary high schools.

When the four school categories without large Calgary high schools were considered, the means did not differ significantly at the .05 level. Similarly, when the four school categories without the small high schools were considered, the four means did not differ significantly at the .05 level. This is represented diagrammatically in Figure 4 by numbering the means from lowest to highest, and then drawing a line under the numbers of the means where there were no significant differences. Even though mean "1" and mean "5" differed significantly, neither differed significantly from the large portion of the population represented by means "2", "3", and "4".



On the basis of the foregoing analysis, it is apparent that there were some significant differences among the Social Studies marks in the samples from the five school categories. The evidence is sufficiently consistent to identify a significant difference between the marks in Social Studies 30 for the small high schools and the large Calgary high schools.

QUESTION 2. WAS ATTENDANCE AT SCHOOL A FACTOR WHICH MAY HAVE CONTRIBUTED TO ANY OVERMARKING WHICH OCCURRED IN THE MARKS WHICH WERE ASSIGNED TO THE STUDENTS?

The answer to this question was sought through the correlation coefficient, r , multiple regression analysis, and the t -test.

The correlation coefficients were calculated for the following for each school category: attendance in a Subject 20 vs Subject 20 marks, attendance in a Subject 30 vs teacher-given Subject 30 marks, and attendance in a Subject 30 vs Departmental Subject 30 marks. These correlation coefficients are given in Tables XV, XVI, and XVII. The critical values of r for significance at both the .05 and .01 levels are also given.

In Table XV there are only two r 's which are significantly different from zero. At the .05 level, .28 for the large rural high schools and .26 for the large Edmonton high schools were significant. In the large rural high schools, attendance in Mathematics 20 correlated positively with Mathematics 20 marks. In the large Edmonton high schools, attendance in Mathematics 30 correlated positively with teacher-given Mathematics 30 marks. The other thirteen r 's in Table XV were not significantly different from zero.

In Table XVI there are also only two r 's which are significantly different from zero. At the .01 level, both

TABLE XV

CORRELATION COEFFICIENTS BETWEEN ATTENDANCE
AT SCHOOL AND MATHEMATICS MARKS FOR
FIVE SCHOOL CATEGORIES

		School Category				
		Small	Medium	Large Rural	Large Calgary	Large Edmonton
N	=	53	47	56	50	63
Attendance vs Math. 20 marks		.22	.22	.28	.16	.24
Attendance vs Tea.-given Math. 30 marks		.13	-.03	.24	.19	.26
Attendance vs Dept. Math. 30 marks		.08	.08	.19	.24	.20
Critical Values of r	.05 level	.27	.29	.26	.28	.25
	.01 level	.35	.37	.34	.36	.32

.34 for the small high schools and .36 for the large Edmonton high schools were significant. In the small high schools and also in the large Edmonton high schools, attendance in Language 20 correlated positively with Language 20 marks. The other thirteen r 's in Table XVI were not significantly different from zero.

In Table XVII there are eight r 's which are significantly different from zero. Three of these r 's were between attendance in Social Studies 20 and Social Studies 20 marks. At the .05 level, .27 for the medium high schools, .25 for the large rural high schools, and .22 for the large Edmonton high schools were all significantly different from zero. In addition, two of these significant r 's were between attendance in Social Studies 30 and teacher-given Social Studies 30 marks. At the .01 level, .31 for the small high schools and .45 for the medium high schools were significantly different from zero. The other three significant r 's were between attendance in Social Studies 30 and Departmental Social Studies 30 marks. At the .01 level, .38 for the medium high schools and .29 for the large Edmonton high schools, and at the .05 level, .27 for the large rural high schools were all significantly different from zero. In each of the eight cases, attendance correlated positively with the marks. The other seven r 's in Table XVII were not significantly different from zero.

Multiple regression analysis revealed that attendance

TABLE XVI
CORRELATION COEFFICIENTS BETWEEN ATTENDANCE
AT SCHOOL AND ENGLISH MARKS FOR
FIVE SCHOOL CATEGORIES

		School Category				
		Small	Medium	Large Rural	Large Calgary	Large Edmonton
N	=	73	60	72	64	84
Attendance vs Lang. 20 marks		.34	-.02	-.06	.04	.36
Attendance vs Tea.-given Eng. 30 marks		.09	.20	-.09	.02	.18
Attendance vs Dept. Eng. 30 marks		-.09	.11	-.09	-.08	.15
Critical Values of r	.05 level	.23	.25	.23	.25	.22
	.01 level	.30	.33	.30	.32	.28

TABLE XVII
CORRELATION COEFFICIENTS BETWEEN ATTENDANCE
AT SCHOOL AND SOCIAL STUDIES MARKS FOR
FIVE SCHOOL CATEGORIES

		School Category				
		Small	Medium	Large Rural	Large Calgary	Large Edmonton
N	=	98	67	78	49	90
Attendance vs Social Studies 20 marks		.13	.27	.25	.22	.22
Attendance vs Tea.-given Soc. St. 30 marks		.31	.45	.21	.20	.19
Attendance vs Dept. Soc. St. 30 marks		.07	.38	.27	.07	.29
Critical Values of r	.05 level	.20	.24	.22	.28	.21
	.01 level	.26	.31	.29	.34	.27

in Mathematics 20 was the third most significant predictor of Departmental Mathematics 30 marks in the medium high schools. Attendance at school was not a significant predictor of Departmental Mathematics 30 marks in any other school category. (p. 45) In English, Language 20 attendance added significantly to the prediction of Departmental English 30 marks in the large Edmonton high schools. Attendance at school was not a significant predictor of Departmental English 30 marks in any other cases. (p. 54) Social Studies 30 attendance was the third most significant predictor of Departmental Social Studies 30 marks in the large Edmonton high schools, and fourth in the large rural high schools. Social Studies attendance was not a significant predictor of Departmental Social Studies 30 marks in any other case. (p. 63)

The means of attendance in the "20" subjects were compared with the means of attendance in the corresponding "30" subjects by using a t-test. This was done in each school category for each of the three subjects. The null hypothesis in each case was $H_0: m_1 = m_2$. The null hypothesis was rejected at the .05 level in each of the following cases: (1) In mathematics for the large Edmonton high schools. (2) In English for the large Calgary high schools. (3) In Social Studies for both the small high schools and the large Edmonton high schools. There was a significant difference between the means of attendance in each of these cases. In three of these significant

differences, the Subject 20 attendance mean was larger than the corresponding Subject 30 attendance mean, while in the other case the Subject 20 attendance mean was smaller. The greatest difference between any pair of means was three. This evidence is not sufficiently consistent to justify any definite conclusions about any differences between Subject 20 attendance and Subject 30 attendance. The attendance means are given in Table XVIII.

TABLE XVIII
MEANS OF ATTENDANCE FOR FIVE
SCHOOL CATEGORIES

	School Category				
	Small	Medium	Large Rural	Large Calgary	Large Edmonton
Math. 20	179	177	180	182	182
Math. 30	177	178	179	184	179
Lang. 20	177	177	180	180	181
Eng. 30	175	177	178	183	179
Soc. St. 20	177	176	179	180	181
Soc. St. 30	174	176	177	183	178

QUESTION 3. WAS CLASS SIZE A FACTOR WHICH MAY HAVE CONTRIBUTED TO ANY OVERMARKING WHICH OCCURRED IN THE MARKS WHICH WERE ASSIGNED TO THE STUDENTS?

The answer to this question was sought through the correlation coefficient, r , multiple regression analysis, and the t -test.

The correlation coefficients were calculated for the following for each school category: Subject 20 class sizes and Subject 20 marks, Subject 30 class sizes and teacher-given Subject 30 marks, and Subject 30 class sizes and Departmental Subject 30 marks. These correlation coefficients are given in Tables XIX, XX, and XXI. The critical values of r for significance at both the .05 and the .01 levels are also given.

Only in English were there any r 's which were significant. In the medium and the large Calgary high schools class size in English 30 correlated significantly with teacher-given English 30 marks, the r 's respectively being $-.34$ and $.26$. The other forty-three r 's in Tables XIX, XX, and XXI were not significantly different from zero.

Multiple regression analysis revealed that Mathematics 20 class size was the second most significant predictor of Departmental Mathematics 30 marks in the medium high schools, and the third most significant in the small, large Calgary, and large Edmonton high schools. Class size in Mathematics 30 was not a significant predictor in any

TABLE XIX
CORRELATION COEFFICIENTS BETWEEN CLASS
SIZE AND MATHEMATICS MARKS FOR
FIVE SCHOOL CATEGORIES

		School Category				
		Small	Medium	Large Rural	Large Calgary	Large Edmonton
N	=	53	47	56	50	63
Class Size vs Math. 20 marks		-.05	.12	.20	-.15	.04
Class Size vs Tea.-given Math. 30 marks		.03	-.12	-.06	.17	.08
Class Size vs Dept. Math. 30 marks		.08	.00	-.07	.09	-.08
Critical Values of r	.05 level	.27	.29	.26	.28	.25
	.01 level	.35	.37	.34	.36	.32

TABLE XX
CORRELATION COEFFICIENTS BETWEEN CLASS
SIZE AND ENGLISH MARKS FOR
FIVE SCHOOL CATEGORIES

		School Category				
		Small	Medium	Large Rural	Large Calgary	Large Edmonton
N	=	73	60	72	64	84
Class Size vs Lang. 20 marks		.08	-.12	.05	-.16	.06
Class Size vs Tea.-given Eng. 30 marks		.22	-.34	-.07	.26	-.04
Class Size vs Dept. Eng. 30 marks		.01	-.10	.02	.19	.03
Critical Values of r	.05 level	.23	.25	.23	.25	.22
	.01 level	.30	.33	.30	.32	.28

TABLE XXI
CORRELATION COEFFICIENTS BETWEEN CLASS
SIZE AND SOCIAL STUDIES MARKS FOR
FIVE SCHOOL CATEGORIES

		School Category				
		Small	Medium	Large Rural	Large Calgary	Large Edmonton
N	=	98	67	78	49	90
Class Size vs Soc. St. 20 marks		.02	-.18	.11	-.13	.02
Class Size vs Tea.-given Soc. St. 30 marks		-.09	-.06	.10	.22	.02
Class Size vs Dept. Soc. St. 30 marks		-.10	.01	.07	-.09	.06
Critical Values of r	.05 level	.20	.24	.22	.28	.21
	.01 level	.26	.31	.29	.34	.27

school category. (p. 45)

In English, Language 20 class size was the third most significant predictor of Departmental English 30 marks in the medium high schools. Class size was not a significant predictor in any other case. (p. 54)

In Social Studies, class size of the Social Studies 20 class was the third most significant predictor of Departmental Social Studies 30 marks in both the medium and the large Calgary high schools. Social Studies 30 class size was the second most significant predictor in the large Calgary high schools. Class size was not a significant predictor in any other case. (p. 63)

The means of the class sizes in the "20" subjects were compared with the means of the class sizes in the "30" subjects by using a t-test. This was done in each school category for each of the three subjects. The null hypothesis in each case was $H_0: m_1 = m_2$. The null hypothesis was rejected in each of the following cases: (1) In mathematics at the .01 level for both the small and medium high schools. (2) In English at the .01 level for the small high schools, and at the .05 level for the medium high schools. (3) In Social Studies at the .01 level for both the small and medium high schools. There was a significant difference between the Subject 20 class size and the Subject 30 class size in each of these cases. In every significant case, the Subject 20 class size was larger than the corresponding Subject 30

class size. The evidence is sufficiently consistent to justify the conclusion that the class sizes in the "20" subjects were significantly larger than the class sizes in the corresponding "30" subjects in both the small and medium high schools. The means of the class sizes are given in Table XXII.

TABLE XXII
MEANS OF CLASS SIZE FOR FIVE
SCHOOL CATEGORIES

	School Category				
	Small	Medium	Large Rural	Large Calgary	Large Edmonton
Math. 20	11.9	17.7	26.0	31.3	33.0
Math. 30	9.4	13.7	25.7	30.3	31.8
Lang. 20	16.8	21.9	25.8	32.1	32.7
Eng. 30	9.6	17.9	25.4	31.1	31.0
Soc. St. 20	17.6	21.2	24.9	31.9	29.8
Soc. St. 30	11.5	18.3	24.4	32.2	31.2

QUESTION 4. WAS THE NUMBER OF YEARS OF UNIVERSITY TRAINING OF THE TEACHER A FACTOR WHICH MAY HAVE CONTRIBUTED TO OVERMARKING IN THE MARKS WHICH WERE ASSIGNED TO THE STUDENTS?

The answer to this question was sought through the correlation coefficient, r , multiple regression analysis, and the t -test. The Edmonton schools were omitted from this portion of the analysis because no data were available.

The correlation coefficients were calculated for the following for each school category: number of years of university training of the Subject 20 teacher vs Subject 20 marks, number of years of university training of the Subject 30 teacher vs teacher-given Subject 30 marks, and number of years of university training of the Subject 30 teacher vs Departmental Subject 30 marks. These correlation coefficients are reported in Tables XXIII, XXIV, and XXV. The critical values of r for significance at both the .05 and .01 levels are also given in each table.

In mathematics none of the r 's were significant.

In English only two r 's were significant. The number of years of university training of the Language 20 teacher correlated significantly with the Language 20 marks in the large Calgary high schools, the value of r being .27. The number of years of university training of the English 30 teachers correlated significantly with the Departmental English 30 marks in the small high schools, the value of r

TABLE XXIII
CORRELATION COEFFICIENTS BETWEEN NUMBER OF YEARS OF
UNIVERSITY TRAINING AND MATHEMATICS MARKS
FOR FIVE SCHOOL CATEGORIES

		School Category				
		Small	Medium	Large Rural	Large Calgary	Large Edmonton
N	=	53	47	56	50	-
Univ. Training vs Math. 20 marks		.14	.03	.00	-.18	-
Univ. Training vs Tea.-given Math. 30 marks		.02	-.02	.01	.00	-
Univ. Training vs Dept. Math. 30 marks		.11	-.01	-.05	.04	-
Critical Values of r	.05 level	.27	.29	.26	.28	-
	.01 level	.35	.37	.34	.36	-

TABLE XXIV
CORRELATION COEFFICIENTS BETWEEN NUMBER OF YEARS OF
UNIVERSITY TRAINING AND ENGLISH MARKS
FOR FIVE SCHOOL CATEGORIES

		School Category				
		Small	Medium	Large Rural	Large Calgary	Large Edmonton
N	=	73	60	72	64	-
Univ. Training vs Lang. 20 marks		-.08	.05	.17	.27	-
Univ. Training vs Tea.-given Eng. 30 marks		-.11	-.09	.22	-.11	-
Univ. Training vs Dept. Eng. 30 marks		-.32	.05	.05	-.24	-
Critical Values of r	.05 level	.23	.25	.23	.25	-
	.01 level	.30	.33	.30	.32	-

TABLE XXV
CORRELATION COEFFICIENTS BETWEEN NUMBER OF YEARS OF
UNIVERSITY TRAINING AND SOCIAL STUDIES MARKS
FOR FIVE SCHOOL CATEGORIES

		School Category				
		Small	Medium	Large Rural	Large Calgary	Large Edmonton
N	=	98	67	78	49	-
Univ. Training vs. Soc. St. 20 marks		.03	.04	.02	.02	-
Univ. Training vs Tea.-given Soc. St. 30 marks		-.15	.18	.22	-.30	-
Univ. Training vs Dept. Soc. St. 30 marks		-.26	.11	.24	-.36	-
Critical Values of r	.05 level	.20	.24	.22	.28	-
	.01 level	.26	.31	.29	.34	-

being $-.32$ in this case.

In Social Studies there were four r 's which were significant. The number of years of university training of the Social Studies 30 teachers was involved in each significant r . The correlation coefficient was $-.30$ with teacher-given Social Studies 30 marks in the large Calgary high schools. The correlation coefficients were $-.26$, $.24$, and $-.36$ with Departmental Social Studies 30 marks in the small, large rural, and large Calgary high schools respectively.

Multiple regression analysis revealed that the number of years of university training of the Mathematics 20 teacher was the fourth most significant predictor of Departmental Mathematics 30 marks for the small high schools, and the third most significant for the large rural high schools. The number of years of university training of the Mathematics 30 teacher was the fifth most significant predictor of Departmental Mathematics 30 marks for the large Calgary high schools. (p. 45)

In English, the number of years of university training of the Language 20 teacher was the second most significant predictor of Departmental English 30 marks in the large rural high schools, and the number of years of university training of the English 30 teacher was the second most significant predictor in the large Calgary high schools and the third most significant in the small high schools. (p. 54)

In Social Studies, the number of years of university training of the Social Studies 20 teacher was the fourth most significant predictor of Departmental Social Studies 30 marks in the small high schools and third most significant in the large rural high schools. The number of years of university training of the Social Studies 30 teacher was the third most significant predictor in the small high schools. (p. 63)

The means of the number of years of university training of the Subject 20 teachers were compared with the means of the number of years of university training of the corresponding Subject 30 teachers by using a t-test. This was done in each school category for each of the three subjects. The null hypothesis in each case was $H_0: m_1 = m_2$. The null hypothesis was rejected in all three subjects at the .01 level for the large rural and the large Calgary high schools. For the medium high schools, the null hypothesis was rejected at the .05 level in mathematics and at the .01 level for both English and Social Studies. The null hypothesis was not rejected in any subject for the small high schools. In every case where there was a significant difference the training of the Subject 30 teachers was greater than the training of the Subject 20 teachers. Therefore, in the medium, large rural, and large Calgary high schools the Subject 30 teachers had more university training than the Subject 20 teachers. In the small high schools the Subject 30

teachers had about the same amount of university training as the Subject 20 teachers. The means of the number of years of university training are given in Table XXVI.

TABLE XXVI
MEANS OF UNIVERSITY TRAINING FOR FIVE
SCHOOL CATEGORIES

	School Category				
	Small	Medium	Large Rural	Large Calgary	Large Edmonton
Math. 20	5.1	4.8	4.8	5.1	-
Math. 30	5.5	5.6	6.0	5.7	-
Lang. 20	4.4	4.3	4.6	4.8	-
Eng. 30	4.9	5.6	5.6	6.0	-
Soc. St. 20	3.9	4.4	4.7	4.6	-
Soc. St. 30	4.3	5.4	5.6	5.8	-

QUESTION 5. WAS THE NUMBER OF YEARS OF TEACHING EXPERIENCE OF THE TEACHER A FACTOR WHICH MAY HAVE CONTRIBUTED TO OVERMARKING IN THE MARKS WHICH WERE ASSIGNED TO THE STUDENTS?

The answer to this question was also sought through the correlation coefficient, r , multiple regression analysis, and the t -test. The Edmonton schools were omitted from this portion of the analysis because no data were available.

The correlation coefficients were calculated for the following for each school category: number of years of teaching experience of the Subject 20 teacher vs Subject 20 marks, number of years of teaching experience of the Subject 30 teacher vs teacher-given Subject 30 marks, and number of years of teaching experience of the Subject 30 teacher vs Departmental Subject 30 marks. These correlation coefficients are reported in Tables XXVII, XXVIII, and XXIX. The critical values of r for significance at both the .05 and the .01 levels are also given in each table.

There were three significant r 's in mathematics, all three being in the large Calgary high schools. At the .01 level, .42, .55, and .60 were all significantly different from zero. Teaching experience correlated significantly with Mathematics 20 marks, teacher-given Mathematics 30 marks, and Departmental Mathematics marks in this school category.

TABLE XXVII
CORRELATION COEFFICIENTS BETWEEN NUMBER OF YEARS OF
TEACHING EXPERIENCE AND MATHEMATICS MARKS
FOR FIVE SCHOOL CATEGORIES

		School Category				
		Small	Medium	Large Rural	Large Calgary	Large Edmonton
N	=	53	47	56	50	-
Tea. Exp. vs Math. 20 marks		.11	-.01	-.16	.42	-
Tea. Exp. vs Tea.-given Math. 30 marks		-.23	.15	.01	.55	-
Tea. Exp. vs Dept. Math. 30 marks		-.10	.10	.07	.60	-
Critical Values of r	.05 level	.27	.29	.26	.28	-
	.01 level	.35	.37	.34	.36	-

TABLE XXVIII
CORRELATION COEFFICIENTS BETWEEN NUMBER OF YEARS OF
TEACHING EXPERIENCE AND ENGLISH MARKS
FOR FIVE SCHOOL CATEGORIES

		School Category				
		Small	Medium	Large Rural	Large Calgary	Large Edmonton
N	=	73	60	72	64	-
Tea. Exp. vs Lang. 20 marks		-.12	.16	-.04	.15	-
Tea. Exp. vs Tea.-given Eng. 30 marks		-.12	-.05	.12	.08	-
Tea. Exp. vs Dept. Eng. 30 marks		-.16	.02	.05	-.07	-
Critical Values of r	.05 level	.23	.25	.23	.25	-
	.01 level	.30	.33	.30	.32	-

TABLE XXIX

CORRELATION COEFFICIENTS BETWEEN NUMBER OF YEARS OF
TEACHING EXPERIENCE AND SOCIAL STUDIES MARKS
FOR FIVE SCHOOL CATEGORIES

		School Category				
		Small	Medium	Large Rural	Large Calgary	Large Edmonton
N	=	98	67	78	49	-
Tea. Exp. vs Soc. St. 20 marks		-.13	-.03	-.02	.23	-
Tea. Exp. vs Tea.-given Soc. St. 30 marks		-.28	.13	.26	.21	-
Tea. Exp. vs Dept. Soc. St. 30 marks		-.30	.11	.14	.06	-
Critical Values of r	.05 level	.20	.24	.22	.28	-
	.01 level	.26	.31	.29	.34	-

None of the r 's were significant in English.

In Social Studies there were three r 's that were significantly different from zero. These were $-.28$ and $-.30$ at the $.01$ level in the small high schools, and $.26$ at the $.05$ level in the large rural high schools. Teaching experience correlated significantly with both teacher-given and Departmental Social Studies 30 marks in the small high schools, the correlation being negative in both cases. Teaching experience correlated positively with teacher-given Social Studies 30 marks in the large rural high schools.

Multiple regression analysis revealed that the teaching experience of the teacher contributed significantly to the prediction of the criterion in only one case. This was in the large Calgary high schools where the teaching experience of the Mathematics 30 teacher was the second most significant predictor of Departmental Mathematics 30 marks. (pp. 45, 54, and 63)

The means of the number of years of teaching experience of the Subject 20 teachers were compared with the means of the number of years of teaching experience of the corresponding Subject 30 teachers by using a t -test. This was done in each school category for each of the three subjects. The null hypothesis in each case was $H_0: m_1 = m_2$. The null hypothesis was rejected in each of the following cases:

(1) In English at the $.05$ level for the small high schools, and at the $.01$ level for the large Calgary high schools.

(2) In Social Studies at the .05 level for the small high schools, and at the .01 level for both the large rural and the large Calgary high schools. In each significant case, the teaching experience of the Subject 30 teachers was greater than the teaching experience of the corresponding Subject 20 teachers. In mathematics the teaching experience of the Mathematics 30 teachers was not significantly different from the teaching experience of the corresponding Mathematics 20 teachers in any school category. The means of the number of years of teaching experience are given in Table XXX.

TABLE XXX
MEANS OF TEACHING EXPERIENCE FOR
FIVE SCHOOL CATEGORIES

	School Category				
	Small	Medium	Large Rural	Large Calgary	Large Edmonton
Math. 20	14.8	15.5	18.2	15.2	-
Math. 30	16.1	17.9	19.2	18.3	-
Lang. 20	15.9	14.9	14.3	11.3	-
Eng. 30	20.2	18.7	16.2	17.9	-
Soc. St. 20	15.6	15.4	11.4	10.2	-
Soc. St. 30	18.8	18.0	16.9	17.8	-

V. SUMMARY OF THE CHAPTER

The summary of the analysis for each of the five questions investigated in this study includes mainly the differences which were significant.

QUESTION 1. DID ANY OVERMARKING OCCUR IN MATHEMATICS, ENGLISH, OR SOCIAL STUDIES IN ANY OF THE SCHOOL CATEGORIES, AND IF SO, TO WHAT EXTENT? (pp. 39-67)

Mathematics

Each of the three mathematics marks significantly predicted the other two mathematics marks about equally well in the small, medium, large Calgary and large Edmonton high schools. In the large rural high schools, Mathematics 20 marks predicted the other two mathematics marks about equally well, while teacher-given and Departmental Mathematics 30 marks predicted each other better than either predicted Mathematics 20 marks.

The comparison of r 's for the five school categories revealed that the samples from the five school categories were probably random samples from a common population, and analysis of variance confirmed that they were. Analysis of variance also revealed that Mathematics 20 marks were significantly greater than Departmental Mathematics 30 marks in all five school categories, and teacher-given Mathematics 30 marks were greater than Departmental Mathematics 30 marks

only in the small high schools. The Mathematics 20 means were not significantly different in any of the five school categories. The same was true of the teacher-given Mathematics 30 means and also the Departmental Mathematics 30 means.

The teacher-given Mathematics 30 marks were the best predictors of the Departmental Mathematics 30 marks in all five school categories. Mathematics 20 marks were the second best predictors of the Departmental Mathematics 30 marks in three school categories.

English

Each of the three English marks significantly predicted the other two English marks about equally well in the small, medium, and large Edmonton high schools. In the large rural high schools, Language 20 marks predicted teacher-given English 30 marks better than they predicted Departmental English 30 marks. Both teacher-given English 30 marks and Departmental English 30 marks predicted the other two English marks about equally well. In the large Calgary high schools, Language 20 marks and teacher-given English 30 marks were better predictors of each other than either were of Departmental English 30 marks, and the Departmental English 30 marks were better predictors of the teacher-given English 30 marks than they were of Language 20 marks.

The comparison of r 's for the five school categories

revealed that the three samples from the large high schools were probably not random samples from a common population. Analysis of variance revealed that the five samples from the five school categories probably were random samples from a common population when either Language 20 marks or teacher-given English 30 marks were the basis of comparison, but not when Departmental English 30 marks were the basis of comparison. In this latter case, the samples from the small and the large Edmonton high schools were probably not random samples from a common population. Apparently there were some significant differences among the English marks from the five school categories. The evidence was not sufficiently consistent to justify any definite conclusions as to where the significant differences were.

Analysis of variance also revealed that the Language 20 marks were significantly larger than the Departmental English 30 marks in the small and medium high schools and that the teacher-given English 30 marks were greater than the Departmental English 30 marks only in the small high schools. The Language 20 means were not significantly different in any of the five school categories. The same was true of the teacher-given English 30 means. The Departmental English 30 mean in the small high schools was significantly smaller than the Departmental English 30 mean in the large Edmonton high schools, but neither differed significantly from the Departmental English 30 means of the other

three school categories.

Teacher-given English 30 marks were the best predictors of Departmental English 30 marks in four of the school categories and second best in the other. Language 20 marks were the best predictors of Departmental English 30 marks in one school category and second best in two other school categories.

Social Studies

Each of the three Social Studies marks significantly predicted the other two Social Studies marks about equally well in the medium, large rural, large Calgary, and large Edmonton high schools. In the small high schools, Social Studies 20 marks predicted Departmental Social Studies 30 marks better than they predicted teacher-given Social Studies 30 marks. Both teacher-given Social Studies 30 marks and Departmental Social Studies 30 marks predicted the other two Social Studies marks about equally well.

The comparison of r 's revealed that the samples from the small, large rural, and large Calgary high schools were probably not random samples from a common population. Analysis of variance revealed that the samples from the five school categories probably were random samples from a common population when Social Studies 20 marks or teacher-given Social Studies 30 marks were the basis of comparison, but not when the Departmental Social Studies 30 marks were the basis of comparison. In this latter case the samples from

the small high schools and the large Calgary high schools were probably not random samples from a common population. The evidence was sufficiently consistent to justify the conclusion that the samples from the small high schools and the large Calgary high schools were probably not random samples from a common population.

Analysis of variance also revealed that the Social Studies 20 marks were significantly greater than the Departmental Social Studies 30 marks in the small, medium, large rural, and large Edmonton high schools. It was further revealed that the teacher-given Social Studies 30 marks were greater than the Departmental Social Studies 30 marks in the small high schools, and less than the Departmental Social Studies 30 marks in the large Calgary high schools. The Social Studies 20 means were not significantly different in any of the five school categories. The same was true of the teacher-given Social Studies 30 means. However, the Departmental Social Studies 30 mean in the small high schools was significantly smaller than the Departmental Social Studies 30 mean in the large Calgary high schools, but neither differed significantly from the Departmental Social Studies 30 means of the other three school categories.

Teacher-given Social Studies 30 marks were the best predictors of Departmental Social Studies 30 marks in four school categories and second best in the other one. Social Studies 20 marks were the best predictor of Departmental

Social Studies 30 marks in one school category, and second best in three others.

QUESTION 2. WAS ATTENDANCE AT SCHOOL A FACTOR WHICH MAY HAVE CONTRIBUTED TO ANY OVERMARKING WHICH OCCURRED IN THE MARKS WHICH WERE ASSIGNED TO THE STUDENTS? (pp. 68-74)

Six of the fifteen r 's between Subject 20 marks and attendance were significantly different from zero. These were .28 for mathematics, .34 and .36 for English, and .27, .25, and .22 for Social Studies. All were positive.

Three of the fifteen r 's between teacher-given Subject 30 marks and attendance were significantly different from zero. These were .26 in mathematics, and .31 and .45 in Social Studies. All were positive.

Three of the fifteen r 's between Departmental Subject 30 marks and attendance were significantly different from zero. These were .38, .29, and .27, all in Social Studies, and all were positive.

Attendance at school added significantly to the prediction of Departmental Subject 30 marks in four cases out of fifteen. In each case it was the least important predictor.

Attendance in a Subject 20 differed significantly from the attendance in the corresponding Subject 30 in four cases out of fifteen, the difference in each case being

three days attendance. Attendance in the "20" subject was greater in three cases and less in one.

QUESTION 3. WAS CLASS SIZE A FACTOR WHICH MAY HAVE CONTRIBUTED TO ANY OVERMARKING WHICH OCCURRED IN THE MARKS WHICH WERE ASSIGNED TO THE STUDENTS?
(pp. 75-80)

None of the r 's between Subject 20 marks and class size were significantly different from zero.

Two of the fifteen r 's between teacher-given Subject 30 marks and class size were significantly different from zero. These were $-.34$ and $.26$. Both were in English.

None of the fifteen r 's between Departmental Subject 30 marks and class size were significantly different from zero.

Class size in a Subject 20 added significantly to the prediction of the Departmental Subject 30 marks in seven cases out of fifteen. Class size in a Subject 30 added significantly to the prediction of the Departmental Subject 30 marks in only one case out of fifteen. In each of these cases class size was either second or third in order of importance as a predictor.

Class sizes in the "20" subjects were significantly greater than class sizes in the corresponding "30" subjects in both the small and the medium high schools, but not in any of the three categories of large high schools.

QUESTION 4. WAS THE NUMBER OF YEARS OF
UNIVERSITY TRAINING OF THE TEACHER A FACTOR
WHICH MAY HAVE CONTRIBUTED TO OVERMARKING IN
THE MARKS WHICH WERE ASSIGNED TO THE STUDENTS?
(pp. 81-87)

Of the twelve r 's between the number of years of university training of the Subject 20 teachers and the Subject 20 marks, only .27 was significant.

Of the twelve r 's between the number of years of university training of the Subject 30 teachers and the teacher-given Subject 30 marks, only $-.30$ was significant.

Four of the twelve r 's between the number of years of university training of the Subject 30 teachers and the Departmental Subject 30 marks were significant. These were $-.26$, $.24$, $-.36$, and $-.32$.

The number of years of university training of the Subject 20 teachers added significantly to the prediction of the Departmental Subject 30 marks in five cases out of twelve. The number of years of university training of the Subject 30 teachers added significantly to the prediction of the Departmental Subject 30 marks in four cases out of twelve. In each of these cases university training was from second to fifth in importance as a predictor.

The number of years of university training of the Subject 30 teachers exceeded the number of years of university training of the Subject 20 teachers in the medium,

large rural, large Calgary, and large Edmonton high schools. In the small high schools, the number of years of university training of the Subject 30 teachers was about the same as the number of years of university training of the Subject 20 teachers.

QUESTION 5. WAS THE NUMBER OF YEARS OF TEACHING EXPERIENCE OF THE TEACHER A FACTOR WHICH MAY HAVE CONTRIBUTED TO OVERMARKING IN THE MARKS WHICH WERE ASSIGNED TO THE STUDENTS? (pp. 88-93)

Of the twelve r 's between Subject 20 marks and teaching experience of the Subject 20 teachers, only .42 was significant.

Three of the twelve r 's between teacher-given Subject 30 marks and teaching experience of the Subject 30 teachers were significant. These were $-.28$, $.26$, and $.55$.

Two of the twelve r 's between Departmental Subject 30 marks and teaching experience of the Subject 30 teachers were significant. These were $-.30$ and $.60$.

The number of years of teaching experience of the teacher added significantly to the prediction of the Departmental Subject 30 marks in only one case out of twenty-four. In the large Calgary high schools the teaching experience of the Mathematics 30 teacher was the second most significant predictor of Departmental Mathematics 30 marks.

The teaching experience of the Subject 30 teachers exceeded the teaching experience of the Subject 20 teachers in five cases out of twelve. Two of these were in English and three were in Social Studies.

CHAPTER IV

FINDINGS, CONCLUSIONS, AND IMPLICATIONS

This study investigated the marks in Mathematics 20 and 30, Language 20 and English 30, and Social Studies 20 and 30 for the 1963-64 and 1964-65 school years, and four factors which may be related to these marks. The four factors were student attendance at school, class size, number of years of university training of the teacher, and number of years of teaching experience of the teacher. The high schools of Alberta were classified into three school categories -- small, medium, and large -- according to the number of teachers in the school. The large high schools were subdivided into three groups -- large rural high schools, large Calgary high schools, and large Edmonton high schools -- and this resulted in five school categories for the analysis. The main problem investigated in this study was overmarking, and five questions were formulated to give direction to the study. The answers to these five questions, as revealed by the analysis which was reported in Chapter III, will now be given.

I. FINDINGS AND CONCLUSIONS

QUESTION 1. DID ANY OVERMARKING OCCUR IN
MATHEMATICS, ENGLISH, OR SOCIAL STUDIES IN

ANY OF THE SCHOOL CATEGORIES, AND IF SO,
TO WHAT EXTENT?

Mathematics

Overmarking occurred in each of the five school categories in Mathematics 20 by about ten percentage points. Overmarking in the teacher-given Mathematics 30 marks occurred only in the small high schools by about ten percentage points. (pp. 44-48)

Only in the large rural high schools were there apparent inconsistencies between the Mathematics 20 marks and the teacher-given Mathematics 30 marks. In the large rural high schools, the Mathematics 20 marks and the teacher-given Mathematics 30 marks were not as consistent from student to student as they were in the other school categories. (pp. 39-43)

The teacher-given Mathematics 30 marks were a better estimation of the students' achievement in the Departmental Mathematics 30 Examinations than were the Mathematics 20 marks. (pp. 43-45)

English

Overmarking in Language 20 occurred in only two school categories -- the small and the medium high schools -- by about ten percentage points. Overmarking in Language 20 did not occur in the large high schools. Overmarking in the teacher-given English 30 marks occurred in the small

high schools only, by about five percentage points. (pp. 55-58)

In two of the large high school categories there were apparent inconsistencies between the Language 20 marks and the teacher-given English 30 marks. In both the large rural and the large Calgary high schools, the Language 20 marks and the teacher-given English 30 marks were not as consistent from student to student as they were in the other three school categories. (pp. 48-52)

In the small and the three categories of large high schools, teacher-given English 30 marks were a better estimation of the Departmental English 30 marks than the Language 20 marks were. In the medium high schools, the Language 20 marks were a better estimation of the Departmental English 30 marks. (pp. 52-55)

Social Studies

Overmarking in Social Studies 20 occurred in the small, medium, large rural, and large Edmonton high schools, by about eight percentage points. Overmarking in the teacher-given Social Studies 30 marks occurred only in the small high schools, by about five percentage points. Undermarking in the teacher-given Social Studies 30 marks occurred in the large Calgary high schools by about six percentage points. (pp. 62-67)

In the small high schools there were apparent inconsistencies between the Social Studies 20 marks and the

teacher-given Social Studies 30 marks. These marks were not as consistent from student to student in the small high schools as they were in the medium and large high schools. (pp. 59-61)

In the medium and large high schools, teacher-given Social Studies 30 marks were a better estimation of the Departmental Social Studies 30 marks than Social Studies 20 marks were. In the small high schools, the Social Studies 20 marks were a better estimation of the Departmental Social Studies 30 marks. (pp. 61-62)

A summary of the overmarking that occurred is presented in Table XXXI.

The findings of this study agree with Black's findings about overmarking. (pp. 2, 3, and 15) Some overmarking occurred in all school categories, but the small and medium high schools showed a greater tendency to overmark than the large high schools.

QUESTION 2. WAS ATTENDANCE AT SCHOOL A FACTOR WHICH MAY HAVE CONTRIBUTED TO ANY OVERMARKING WHICH OCCURRED IN THE MARKS WHICH WERE ASSIGNED TO THE STUDENTS?

Student attendance at school was quite consistent in both school years in all five school categories. (pp. 73-74) Therefore, attendance was not a factor which caused

TABLE XXXI
SUMMARY OF THE OVERMARKING THAT OCCURRED IN
MATHEMATICS, ENGLISH, AND SOCIAL STUDIES
IN FIVE SCHOOL CATEGORIES

	School Categories				
	Small	Medium	Large Rural	Large Calgary	Large Edmonton
Math. 20	Yes*	Yes	Yes	Yes	Yes
Tea.-given Math. 30	Yes	No**	No	No	No
Lang. 20	Yes	Yes	No	No	No
Tea.-given Eng. 30	Yes	No	No	No	No
Soc. St. 20	Yes	Yes	Yes	No	Yes
Tea.-given Soc. St. 30	Yes	No	No	Under- marking	No

*Yes -- overmarking occurred

**No -- overmarking did not occur

overmarking within any school category.

Attendance at school had either no effect upon Subject 20 marks, or else it had a positive effect with higher attendance resulting in higher marks. Mathematics 20 marks were affected the least by attendance, and Social Studies 20 marks were affected the most. (pp. 68-73)

Attendance at school had either no effect on the teacher-given Subject 30 marks, or else it had a positive effect. Teacher-given English 30 marks were not affected by attendance. Teacher-given Mathematics 30 marks were not affected as much by attendance as teacher-given Social Studies 30 marks were. Attendance at school also had an effect on the Departmental Social Studies 30 marks. Neither Departmental Mathematics 30 marks nor Departmental English 30 marks were affected by attendance. (pp. 68-73)

The effect of attendance on marks was not sufficiently consistent in any school category to justify any conclusions about differences among the five school categories. However, there was consistency in the effect of attendance on Social Studies marks, with higher attendance resulting in higher marks.

Attendance at school had little significant effect on the prediction of the Departmental Subject 30 marks. (pp. 45, 54, 63, 70, and 73)

QUESTION 3. WAS CLASS SIZE A FACTOR WHICH MAY

HAVE CONTRIBUTED TO ANY OVERMARKING WHICH OCCURRED
IN THE MARKS WHICH WERE ASSIGNED TO THE STUDENTS?

In both the small and the medium high schools, Subject 20 class size exceeded Subject 30 class size. In the three large high school categories, the Subject 20 classes and the Subject 30 classes were about the same size. (pp. 79-80) In the small and large high schools, class size did not have any effect on the overmarking that occurred. In the medium high schools, larger class size was associated with the overmarking that occurred.

Class size did not have any consistent effect on the marks in either mathematics, English, or Social Studies. (pp. 75-78)

Subject 20 class size was a better predictor of Departmental Subject 30 marks than Subject 30 class size was. (pp. 45, 54, 63, 75-79)

QUESTION 4. WAS THE NUMBER OF YEARS OF
UNIVERSITY TRAINING OF THE TEACHER A FACTOR
WHICH MAY HAVE CONTRIBUTED TO OVERMARKING IN
THE MARKS WHICH WERE ASSIGNED TO THE STUDENTS?

The number of years of university training of the teacher did not affect overmarking in the small high schools. In the medium and large high schools lower amounts of university training were associated with the overmarking that occurred. (pp. 86-87, 108)

The evidence about the effects of the number of years of university training of the teacher on marks which the students received was not sufficiently consistent to justify any definite conclusions. (pp. 81-85) This is in agreement with the review of the literature reported in Chapter II. (pp. 18-23)

The number of years of university training of the teacher was a predictor of the Departmental Subject 30 marks in nine cases out of a possible twenty-four. It was not the most important predictor in any case. (pp. 45, 54, 63, 85-86)

QUESTION 5. WAS THE NUMBER OF YEARS OF
TEACHING EXPERIENCE OF THE TEACHER A FACTOR
WHICH MAY HAVE CONTRIBUTED TO OVERMARKING IN
THE MARKS WHICH WERE ASSIGNED TO THE STUDENTS?

The number of years of teaching experience of the teacher did not have any consistent effect on the over-marking which occurred in the five school categories. (pp. 92-93)

The teaching experience of the mathematics teachers affected the mathematics marks in the large Calgary high schools, but not in any other school category. The teaching experience of the English teachers did not affect the marks in English. The teaching experience of the Social Studies 30 teachers affected both the teacher-given and the

Departmental Social Studies 30 marks in the small high schools, and the teacher-given Social Studies 30 marks in the large rural high schools. (pp. 88-92)

The evidence was sufficiently consistent in the large Calgary high schools to justify the conclusion that increased teaching experience improved students' marks in mathematics. In the small high schools, too, the evidence was sufficiently consistent to justify the conclusion that increased teaching experience corresponded to decreased students' marks in Social Studies 30. In all other cases the evidence did not justify the conclusion that teaching experience affected students' marks. Thus, the evidence was not sufficiently consistent to justify any general conclusions about the effects of teaching experience on students' marks. This study has not shed much new light on an old question! (pp. 23-27)

SUMMARY OF FINDINGS AND CONCLUSIONS

This study revealed that:

1. Overmarking occurred in Mathematics 20 and 30 marks, Language 20 and English 30 marks, and Social Studies 20 and 30 marks in the small high schools of Alberta, that is, those with three or fewer teachers.

2. Overmarking occurred in Mathematics 20 marks, Language 20 marks, and Social Studies 20 marks in the medium high schools of Alberta, that is, those with four to eight

teachers.

3. Overmarking occurred in Mathematics 20 marks and Social Studies 20 marks in the large rural high schools of Alberta, that is, those with nine or more teachers but not located in Calgary or Edmonton.

4. Overmarking occurred in Mathematics 20 marks, and undermarking occurred in the teacher-given Social Studies 30 marks in the Calgary high schools, all large high schools having nine or more teachers.

5. Overmarking occurred in Mathematics 20 marks and Social Studies 20 marks in the Edmonton high schools, all large high schools having nine or more teachers.

6. Student attendance at school was about the same for the two school years.

7. Student attendance at school did not affect the overmarking that occurred within any school category.

8. Class size in the "30" subjects was smaller than class size in the "20" subjects in the small and medium high schools. In the large high schools, class size in the "30" subjects was about equal to class size in the "20" subjects.

9. Class size did not affect the overmarking that occurred in the small and large high schools. In the medium high schools, larger class size was associated with the overmarking that occurred.

10. The number of years of teacher training of the

teacher did not affect the overmarking that occurred in the small high schools. In the medium and large high schools, lower amounts of university training were associated with the overmarking that occurred.

11. The number of years of teaching experience of the teacher did not have any consistent effect on the overmarking that occurred in the five school categories.

12. Increased teaching experience was associated with increased student achievement in mathematics in the Calgary high schools.

13. Increased teaching experience was associated with decreased student achievement in Social Studies 30 in the small high schools.

14. Teachers throughout Alberta high schools were consistent in their view of the achievement of their students in mathematics, English, and Social Studies.

II. IMPLICATIONS

This study revealed that the teachers of both Mathematics 20 and Mathematics 30 were consistent throughout the Province of Alberta in their view of the achievement of their mathematics students. The overmarking that occurred in Mathematics 20 marks in all school categories implies that either the teachers' marks were too high, or the Departmental marks were too low. For the following reasons the latter seems to be the more probable. The weaker

mathematics students were eliminated from mathematics by their low marks before they reached Mathematics 30. This would skew the distribution curve of the Mathematics 30 students to the right. The Departmental marks were distributed according to the normal curve, and this would automatically lower these students' achievement on the Departmental Examinations. It seems very likely that the lack of overmarking in the teacher-given Mathematics 30 marks in the medium and large high schools resulted because the teachers in these schools adjusted their marks to fit the normal curve in order to correspond with the Department's procedure. With the smaller classes in the small high schools this was not possible because a small group is not normally distributed. On this basis, the new procedure adopted by the Department of Education in 1966 of distributing students' Departmental Examination marks according to a curve determined by the ability of all the students, is a better procedure than fitting them to the normal curve.

This study also revealed that the teachers from all school categories were consistent in their view of the achievement of their students in Language 20, English 30, Social Studies 20, and Social Studies 30. This consistency in all three subject areas investigated in this study implies that the teachers of these subjects in all school categories did a good job of judging the achievement of their students. The overmarking that did occur in these

subjects occurred, not because the teacher-given marks differed, but because the Departmental Examination marks differed, with the higher marks occurring in the large high schools. How might these higher marks in the large high schools be accounted for?

One possibility is attendance at school. The students in the large high schools were in school from five to eight days longer per year than those in the small and medium high schools. This could possibly account for the difference, since higher attendance, especially in Social Studies 30, tended to produce higher Departmental marks. It appears that students in the smaller high schools need more attendance at school in order to compete on Departmental Examinations. This is an area for further research.

Another possible factor, which was not investigated in this study, was the high school program of the student. In order to graduate from high school, a student had to have credit in either English 30 or English 33, and either Social Studies 30 or Social Studies (Diploma). Because of low enrollments in the smaller high schools, both the "30" and the "33" or Diploma subjects were not usually taught. This restriction was not present in most of the large high schools where enrollments were much larger. Thus, nearly every student in the smaller high schools wrote the Departmental Subject 30 Examinations, while in the large high schools only the more capable students wrote the "30"

Departmental Examinations, and the rest wrote the "33" or Diploma examinations. A comparison of the abilities of the students that wrote the Departmental Examinations in each size of high school would reveal whether or not this conjecture is true.

The consistency of the teacher-given Subject 30 marks has an implication for the universities in Alberta. The teacher-given Subject 30 marks could be effectively used to determine university entrance without significantly affecting the present admission requirements. This would certainly be advantageous to both the universities and the students because it would provide greater time for planning and organizing for the coming university term.

It seemed at the commencement of this research that smaller classes ought to produce higher student achievement than larger classes because of the better opportunity for the teacher to give individual attention to the needs of each student. This has not been confirmed by this research. However, it may be that smaller classes in the small high schools did increase the achievement of the students, and their achievement would have been lower had they been enrolled in larger classes. It may be that the smaller classes did partially compensate for the lack of any administrative selectivity of students for the "30" subjects in the smaller high schools. This also is an area where further research would be appropriate.

Classes of approximately thirty students produced higher marks on Departmental Examinations than did the smaller classes. Thus, the smaller classes in the small high schools appear to have been uneconomic in terms of student achievement. Further research is needed to determine optimum class size for maximum student achievement.

As a result of this study, the writer is of the opinion that the small high school of three or fewer teachers has become an insignificant entity in the educational system of Alberta. Although none of the factors accounted for it, overmarking was a reality for the students in the small high schools. Even though the number of students is small, the problem deserves careful consideration by educators in these schools.

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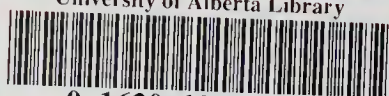
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